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CORRUGATED METAL PIPE WORK PLAN

THIRD MODIFICATION FOR THE ADMINISTRATIVE ORDER ON CONSENT FOR REMOVAL ACTION CERCLA DOCKET NO. 10-2011-0017

Property:
Jorgensen Forge Property
Jorgensen Forge Outfall Site
8531 East Marginal Way South
Seattle, Washington

Prepared for:
U.S. Environmental Protection Agency
Region 10
1200 Sixth Avenue
Seattle, Washington

Date: January 21, 2016

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Seattle, Washington 98101

Prepared for:

U.S. Environmental Protection Agency
Region 10
1200 Sixth Avenue
Seattle, Washington 98101

Prepared on Behalf Of:

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ACRONYMS AND ABBREVIATIONS

BMP	best management practice
Boeing	The Boeing Company
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CMP	corrugated metal pipe
DMU 5	JFEAA Dredge Management Unit 5
EMJ	Earle M. Jorgensen
Ecology	Washington Department of Ecology
EPA	U.S. Environmental Protection Agency
First Modification	*First Modification to the Administrative Order on Consent for Removal Action at the Jorgensen Forge Outfall Site, CERCLA Docket No. 10-2011-0017*
HASP	health and safety plan
JFC	Jorgensen Forge Corporation
JFEAA	Jorgensen Forge Early Action Area
JFOS	Jorgensen Forge Outfall Site; the area encompassing the northwest corner of the Jorgensen Forge Property and the southwest corner of the Boeing Plant 2 Property, subject to CERCLA Docket No. 10-2011-0017
LDW	Lower Duwamish Waterway
METRO	King County Wastewater Treatment Division
NAD83	North American Datum 1983
NAVD88	North American Vertical Datum 1988
Order	Administrative Order on Consent for Removal Action, CERCLA Docket No. 10-2011-0017
Owners	JFC and Boeing
PCB	polychlorinated biphenyl

ACRONYMS AND ABBREVIATIONS (CONTINUED)

Pipes	two decommissioned stormwater conveyance pipes located along the north margin of the Jorgensen Forge Property
Plant 2	Boeing Plant 2 Property
PPE	personal protective equipment
ppm	parts per million
QAPP	Quality Assurance Project Plan
RACR	Removal Action Completion Report
RCRA	Resource Conservation and Recovery Act
SAP	Sampling and Analysis Plan
Second Modification	*Second Modification to the Administrative Order on Consent for Removal Action at the Jorgensen Forge Outfall Site, CERCLA Docket No. 10-2011-0017*
SoundEarth	SoundEarth Strategies, Inc.
SSP	steel sheet pile
TCE	trichloroethylene
TCLP	Toxicity Characteristic Leaching Procedure
TESC	Temporary Erosion and Sedimentation Control
Third Modification	*Third Modification to the Administrative Order on Consent for Removal Action at the Jorgensen Forge Outfall Site, CERCLA Docket No. 10-2011-0017*
VOC	volatile organic compound

1.0 INTRODUCTION

The Jorgensen Forge Outfall Site (JFOS) Corrugated Metal Pipe (CMP) Work Plan has been prepared by SoundEarth Strategies, Inc. (SoundEarth) on behalf of the Jorgensen Forge Corporation (JFC) and The Boeing Company (Boeing), collectively, the Owners, pursuant to the *Third Modification to the Administrative Order on Consent for Removal Action* (Order) *at the Jorgensen Forge Outfall Site* (Third Modification; EPA 2015a), Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Docket No. 10-2011-0017, signed by JFC, Boeing, and the U.S. Environmental Protection Agency (EPA) on June 25, 2013 (EPA 2010b). This CMP Work Plan has been revised in response to EPA's comment letter dated October 29, 2015 (EPA 2015b). The submittal of this CMP Work Plan to the EPA shall be considered a compliance milestone of the Third Modification.

The purpose of this CMP Work Plan is to provide the EPA with the proposed scope of work to be performed at the Jorgensen Forge Outfall Site under the Third Modification in accordance with its terms and conditions. The scope of the removal action to be completed under the Third Modification, as described in this CMP Work Plan, includes removal of the CMP sections of two stormwater conveyance pipes (Pipes) that formerly discharged into the Lower Duwamish Waterway (LDW), and installation of structural shoring to allow upland excavation of contaminated soil to depths of 32 feet (or Elevation -16, relative to the North American Vertical Datum 1988 [NAVD88]) below the highest adjacent ground surface. The upgradient manholes, contributing laterals, and clay sections of the Pipes were decommissioned in place in 2011 under the original Order; that work and subsequent completed phases of the removal action and associated investigations are described in greater detail in Section 3.0 below.

Soil contaminated with greater than 1 part per million (ppm) polychlorinated biphenyls (PCBs) will be removed with the CMPs. The scope of the proposed removal action is described in Section 5.0. Forthcoming plans, specifications, and contractor submittals will be provided to EPA for review. The contractor submittals will describe means and methods for contractor health and safety, construction best management practices (BMPs), decontamination procedures, handling of construction-derived waste and wastewater, and scheduling/sequencing of work. In addition, the Owners' representatives and contractor will participate in a preconstruction meeting with EPA, and additional meetings as necessary to fully review the contractor's implementation of BMPs.

The potential for contamination to migrate through the existing top-of-bank steel sheet pile (SSP) wall, between this CMP removal action area and the adjacent Jorgensen Forge Early Action Area (JFEAA) Dredge Management Unit 5 (DMU 5) removal action area, will be addressed through pre- and post-removal action sampling completed as close as practicable to seams along the waterway side of the SSP. The scope of pre- and post-removal action sampling next to the SSP is described in a separate, stand-alone Technical Memorandum submitted to EPA on January 13, 2016 (in advance of this CMP Work Plan submittal so as to allow earlier approval and performance of this sampling effort). Measures to control potential seepage are presented in Section 5.5.3.

The terms and conditions of the Third Modification require responses to nine topics defined in Conditions 5a through 5i. The following table summarizes the organization of this CMP Work Plan relative to the required Conditions.

Third Mod. Condition No.	Description	CMP Work Plan Section
Not Applicable	Introduction and regulatory framework	1.0 Introduction
Not Applicable	Describe report organization	1.0 Introduction
Not Applicable	Describe project location, setting, and mechanism of historical PCB release	2.0 Project Background
Not Applicable	Summarize previous investigations, utility decommissioning, and removal actions	3.0 Work Completed Under the Order and Prior Modifications
5a	Summarize the CMP boundaries pertinent to the activities to be completed under this Third Modification	3.0 Work Completed Under the Order and Prior Modifications
5b	Summarize past data that characterized the nature and extent of the CMP and the PCB contamination in the vicinity of the CMP	4.0 Nature and Extent of Contamination
5c	Summarize the excavation volumes for soils	4.0 Nature and Extent of Contamination
5d	Summarize the actions and objectives to be completed under this Third Modification	5.0 Removal Action Objectives
5e	Describe the means and methods for the excavation and proper disposal of the CMP and soils and treatment of waste water	5.0 Removal Action Objectives
5f	Identify performance criteria by which successful completion of the CMP Work Plan to be completed under this Third Modification will be evaluated	6.0 Performance Criteria
5g	Identify the anticipated key CMP Work Plan schedule milestone dates	7.0 Anticipated Timeline and Key Milestones
5h	Describe the project organization, responsibilities, and lead personnel qualifications	8.0 Project Organization
5i	Describe post-excavation site restoration	5.6 Site Restoration
Not Applicable	References	9.0 References

2.0 PROJECT BACKGROUND

The JFOS project is located east-adjacent to the top-of-bank line of the LDW and spans the property boundary between the Jorgensen Forge Property and the Boeing Plant 2 Facility (Plant 2) in Seattle, Washington (Figure 1). The Jorgensen Forge Property is bounded by Plant 2 to the north, East Marginal Way South to the east, Boeing Isaacson-Thompson Property to the south, and the LDW to the west. The JFOS area is accessible from the Jorgensen Forge Property and Plant 2, but the primary access is from the Jorgensen Forge entrance gate at 8531 East Marginal Way South.

The project background for the JFOS project is summarized in Section 2.1. Proposed JFOS work relative to Plant 2 under the Resource Conservation and Recovery Act (RCRA) Corrective Action Order with the EPA is summarized below in Section 2.2.

2.1 JFOS PROJECT

The JFOS encompasses the Pipes that formerly discharged into the LDW. As detailed in the *Action Memorandum for the Jorgensen Forge Outfall Site, Seattle, King County, Washington* (EPA 2010a), numerous environmental investigations documented the presence of elevated concentrations of PCBs in the Pipes and in soil surrounding and underlying portions of the CMPs within 150 feet from the points of discharge to the LDW (EPA 2010a). The results of several phases of investigation have defined the vertical extent and the north, south, east, and west lateral extents of PCB-contaminated JFOS soil greater than 1 milligram per kilogram dry weight; Floyd|Snider 2011, AQEA and Farallon 2012, AQEA 2013, SoundEarth 2014b).

The results of previous investigations, including the irregular vertical and lateral distributions of PCBs in soil, are consistent with historical releases from the outlets and sections of the CMPs that exhibited visible damage during prior video inspections.

2.2 BOEING PLANT 2

As noted above, the JFOS removal action spans the JFC-Plant 2 property boundary. JFOS coordination is required with the Plant 2 RCRA Corrective Action Order that was executed between EPA and Boeing in 1994. The part of Plant 2 affected by the JFOS removal action and, therefore, requiring joint CERCLA-RCRA approval of this CMP Work Plan, is the very southwest corner of Plant 2. Specifically, JFOS implementation of the proposed design requires a temporary excavation within the Plant 2 (2-66) sheet pile containment wall, and excavation and backfilling of the approximately 3-foot wide strip of soil present between the south 2-66 sheet pile wall and the JFC-Plant 2 property boundary. Prior remedial actions in that area, particularly within the 2-66 sheet pile containment wall, are reflected in the proposed JFOS removal action discussed below.

To facilitate timely coordination and joint EPA approvals, this CMP Work Plan is being submitted to the EPA Plant 2 RCRA Project Manager for joint review, comment, and approval. The portions of the JFOS removal action most germane to the Plant 2 RCRA Order are found in Sections 5.4 and 5.5, which includes descriptions of specific work proposed inside the 2-66 sheet pile wall and on the soils between it and the JFC-Plant 2 property boundary (refer to Figure 1). JFOS work involving Plant 2 will be documented in the RCRA Order record.

3.0 WORK COMPLETED UNDER THE ORDER AND PRIOR MODIFICATIONS

Work completed under the original Order included: subsurface investigation in the vicinity of the Pipes' outfalls; video inspection of the Pipes and associated laterals; cleaning the clay portions of the Pipes; and sealing seven manholes (Floyd|Snider 2011). The Pipes were also exposed and sealed at the transition from clay to CMP (Figures 2 and 4), approximately 125 feet east of the former outfalls (approximate Easting 1275860 feet, North American Datum 1983 [NAD83]). The transition from clay to CMP represents the western boundary of the work completed under the original Order, and the eastern boundary of the work required under the Third Modification. The following work was completed under previous modifications to the Order:

- The *First Modification to the Administrative Order on Consent for Removal Action at the Jorgensen Forge Outfall Site* (First Modification; EPA 2012) required supplemental subsurface investigations to further define the lateral extents of PCBs in the vicinity of the outfalls and the vertical extent west of the transition from clay to CMP (AQEA and Farallon 2012, AQEA 2013).

Supplemental subsurface investigations defined the north, east, and south extent of PCBs, but indicated that elevated PCBs were present beneath the east bank of the LDW (the Underbank Area).

- The *Second Modification to the Administrative Order on Consent for Removal Action at the Jorgensen Forge Outfall Site* (Second Modification; EPA 2013) required an angle boring investigation of the Underbank Area, and the design and installation of a shoreline bank containment barrier that would integrate with and facilitate completion of the JFEAA bank removal project (SoundEarth 2014b). The shoreline containment barrier encompassing JFEAA DMU 5 was installed in February 2014. In June 2014, JFC installed a 20-foot-long concrete wing wall along the south boundary of the JFOS to form a durable boundary and accommodate changing slope configurations during alternating phases of work on the JFOS and JFEAA projects. Upon completion of the JFEAA bank removal project, the three in-water sides of the barrier were removed in September 2014, covered, and stored at the JFOS site (SoundEarth 2014a). The upland side of the shoreline containment barrier marking the eastern waterway boundary was left in place and currently forms the western boundary of the JFOS (SoundEarth 2014a).

4.0 NATURE AND EXTENT OF CONTAMINATION

PCB-contaminated soil and the CMP portions of the Pipes are the focus of the upland removal action described in this CMP Work Plan. The results of previous investigations indicate that PCBs in soil at the JFOS are consistent with historical releases of contaminated storm runoff through the outlets and corroded sections of the CMP.

Corroded sections of the CMP were identified and documented during the course of prior video inspections completed under the Plant 2 RCRA Order. Subsequent investigations and updated mapping confirm that the maximum PCB concentrations in soil occur in close proximity to the corroded sections of the CMP, and diminish variably with increasing distance and depth from the CMP.

The vertical and lateral extents of PCB contamination beneath the CMPs at the JFOS are defined by:

- Subsurface extents in soil
- Man-made features or administrative boundaries, such as:
  - adjacent removal actions proceeding under separate Orders
  - existing sheet pile walls
  - invert elevations of the CMPs
  - previously completed phases of work
- The cleanup level of greater than 1 ppm

Section 4.1 describes the nature and extent of PCBs at the JFOS site in greater detail. Other compounds in soil have been characterized at the JFOS for the purpose of waste profiling and proper disposal, as described in Section 4.2; however, the removal action area is determined by the extent of PCBs.

4.1 POLYCHLORINATED BIPHENYLS

Concentrations of PCBs greater than 1 ppm in soil have been detected beneath the CMPs within an irregularly shaped area that measures approximately 25 feet north–south by 90 feet east–west. The CMPs are buried between approximate Elevations of +7 and +10 feet NAVD88. Investigation boring locations and sample analytical results are summarized on Figure 2.

- **Maximum Concentration.** The maximum detected concentration of PCBs in soil at JFOS was 330 ppm in boring JF-DGP3, between Elevations of +6 and +4 feet NAVD88, approximately 3 to 5 feet deeper than the bottom of the 12-inch CMP.
- **Vertical Extent.** The maximum vertical extent of PCB-contaminated soil is Elevation -16 feet NAVD88 at the location of boring JF-DGP3; however, the majority of the PCB-contaminated mass at the JFOS is encountered shallower than Elevation -10 feet NAVD88.
- **Lateral Extent.** The lateral extent of PCBs is characterized by the following boundaries:
  - **North.** The existing Boeing sheet pile wall near former Plant 2 Building 2-66 serves as the administrative and man-made north boundary of the JFOS. Removal action activities north of the existing Boeing sheet pile wall were completed under separate order.
  - **East.** The transition point from clay pipe to CMP defines the east boundary of the work required under the Third Modification. Upstream manholes and laterals were decommissioned and the clay pipes were cleaned and decommissioned in place in 2011 under the original Order (Floyd|Snider 2011). Vertical PVC risers were installed to facilitate cleanout of the 12" and 24" clay pipes, these risers were later removed at the clay-CMP transition but the concrete seals remain in place. Borings advanced in close proximity to the clay pipes (borings T1B1, T1B2, T2B1, and T2B2) did not encounter regulated concentrations of PCBs in soil (Anchor 2013).
  - **South.** The south boundary is defined by the southward extent of PCBs through soil, up to 25 feet south of the JFC-Plant 2 property line. PCB concentrations diminish toward the south between borings JF-DGS3 and JF-DGP5, as the distances from the CMP sources increase. The location of boring JF-DGP5 is considered inside the boundary of the JFOS removal action area, due to the confirmation of PCB concentrations that exceed 1 ppm at that location. The south boundary of the JFOS removal action area does not extend as far south as boring JF-DGS3, where concentrations of PCBs either are not detected or are well below 1 ppm. The south boundary also is identified by an existing concrete wing wall that represents the administrative boundary between the JFEAA and JFOS projects. JFEAA removal action activities south of the concrete wing wall were performed under separate order.
  - **West.** An existing SSP wall defines the western boundary of the JFOS site. The Owners installed the western SSP wall under the Second Modification where it serves as an administrative boundary between the top of bank (Mean Higher High Water) of the LDW and the upland jurisdiction. In-water removal action activities west of the SSP wall were performed under separate order as part of the JFEAA project.

With four exceptions (borings T2B4, 2-66-SP-10, JF-DGP2, and JF-DGS1), PCBs either have not been detected or are below 1 ppm from samples collected above the CMPs. The maximum concentration of PCBs detected above the CMPs is 14 ppm in boring JF-DGP2 at approximate Elevations of +13.5 to +15 feet NAVD88. The estimated, in-place volume of "Subtitle C"-level (i.e., concentrations > 50 ppm) PCB-

contaminated soil, found at or below the elevation of the CMPs, is approximately 620 cubic yards. An estimated 550 cubic yards of "Subtitle D" overburden (soils containing less than or equal to 50 ppm PCBs) overlies the CMPs.

4.2 OTHER COMPOUNDS

Selected soil samples representative of upland conditions in the vicinity of the JFOS have been analyzed for other compounds, including volatile organic compounds (VOCs) and metals, to confirm appropriate waste characterization and profile purposes(Floyd|Snider 2011; AQEA 2012; AQEA and Farallon 2013). The waste characterization and profiling results for other compounds confirm the Subtitle D classification for soils containing less than or equal to 50 ppm PCBs.

In 2011, two soil samples were analyzed for eight leachable RCRA metals by the Toxicity Characteristic Leaching Procedure (TCLP) by EPA Method 6010B. The following metals were detected in boring T1B3 and/or T2B4: TCLP barium, 0.06 to 0.1 ppm; TCLP cadmium, 0.4 ppm; and TCLP lead, 0.1 to 0.4 ppm (Floyd|Snider 2011). TCLP arsenic, TCLP mercury, TCLP selenium, and TCLP silver were not detected in boring T1B3 or T2B4 (Floyd|Snider 2011). These TCLP concentrations were below their respective hazardous waste designation concentrations.

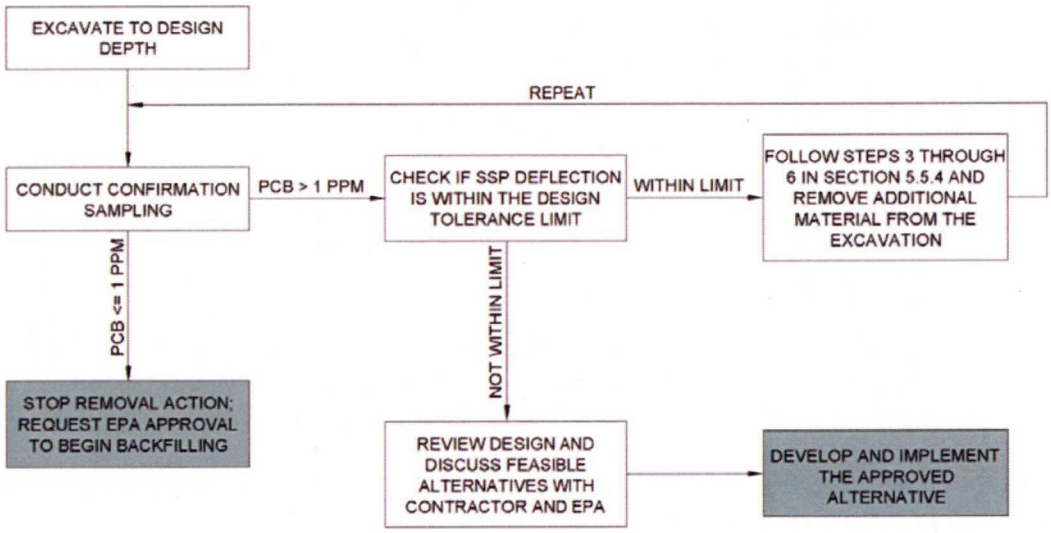
The project contracting documents will include a change-order provision for scenarios such as unanticipated waste, obstructions, or need to exceed the design depth. Due to the lateral and vertical constraints that apply to this project, such scenarios are likely to trigger a supplemental design, followed by contractor resubmittals and additional EPA review.

5.0 REMOVAL ACTION OBJECTIVES

The removal action will include a combination of excavation methods to access and remove overburden soil, the CMPs, and PCB-contaminated soil (greater than 1 ppm). The lateral extent of PCBs at the site is defined from the earlier phases of investigation summarized above in Section 4.1. Stage 1 removal action has been completed and documented in *Removal Action Completion Report, CMP Removal Action – Stage 1, Unshored Excavation Area,* submitted January 13, 2016 (RACR; SoundEarth 2016).

The designed vertical extent of the Stage 2, Shored Excavation Area removal action is anticipated to go no deeper than -16 feet NAVD88. The design depth of the excavation is based on prior investigation results and varies across the excavation bottom (i.e., not flat). The vertical extent may be selectively extended deeper depending on the results of confirmation sampling and deflection tolerance. Deflection tolerance is discussed in greater detail below in Section 5.5.

The following decision tree articulates the relationship between PCB concentration thresholds and engineering-based decisions:



In order to meet the anticipated timeline and milestones summarized in Section 7.0, and address the EPA's time-critical removal action requirements under the Third Modification, the earthwork and shoring tasks are proceeding according to the following sequence and anticipated timeline:

- September 2015: Stage 1, Unshored Excavation Area(Completed; SoundEarth 2016):
  - Property security fence realignment (Section 5.1).
  - Removal of the concrete surfacing on Plant 2 in the 2-66 SP-10 sample location.
  - Removal of anomalous PCB-contaminated soil from the location of boring 2-66-SP-10, to initiate the time-critical removal action (Section 5.4; Figures 4 and 6). This required a small excavation approximately 9 feet deep to remove soil with concentrations of PCBs greater than 1 ppm, and disposal of this soil at a permitted Subtitle D landfill.
  - Collection of confirmation samples from the bottom and each of the four sidewalls of the initial excavation at boring 2-66-SP-10, to verify that PCB concentrations are 1ppm or less, in compliance with the cleanup level (Figure 7; SoundEarth 2016).
  - Removal of overburden soil to expose the tops of the CMPs, and disposal of overburden soil at a permitted Subtitle D landfill (Section 5.4; Figures 4, 5, and 6).
  - Removal of the CMPs and disposal at a permitted Subtitle C landfill (Section 5.4).
  - Collection of confirmation samples under the removed pipes to verify compliance with the 1 ppm cleanup level (Figure 7; SoundEarth 2016).
  - Following EPA approval, backfilling the excavation with clean, imported backfill to match surrounding grades.

- Collection of post-construction baseline samples from the surface of the granular backfill material, from the same approximate northing and easting coordinates as bottom confirmation sample location numbers 9, 10, and 11 (Figure 7, Note 2; SoundEarth 2016).
- Placement of quarry spalls atop the gravel surfacing to limit soil erosion.
- Compaction and sloping of backfilled surfaces such that stormwater runoff does not leave the project area.

- Second/Third Quarter 2016: Stage 2, Shored Excavation Area:
  - Auger-cast grouted piles at the connection points between the existing 2-66 sheet pile wall and the new segments of the SSP shoring enclosure (Section 5.5).
  - Installation of SSP panels (Section 5.5).
  - Excavation of the imported fill soil inside the south adjacent side of the 2-66 sheet pile wall. This imported soil was placed in 2012 following removal by Boeing of contaminated vadose zone soils inside the 2-66 sheet pile wall. The imported backfill will be removed to the groundwater table to reduce loads on the 2-66 sheet pile wall when the adjacent JFOS shored excavation is conducted (Section 5.4). This soil will be stockpiled and tested, and if appropriate, reused as backfill following approval by the EPA RCRA Project Manager for Plant 2.
  - Removal of soils to the top of the CMPs and disposal of these soils at a permitted Subtitle D landfill.
  - Removal of the CMP and associated soil inside the shored portion of the excavation to the maximum target depth of Elevation -16 feet NAVD88, and disposal of the excavated CMP and soil at a permitted Subtitle C landfill (Section 5.5, Figures 4 and 5).
  - Collection of six confirmation samples from the bottom of the shored excavation to verify compliance with the 1 ppm cleanup level (Section 5.5.5; Figure 7). The excavation will be expanded and re-sampled if the initial confirmation samples indicate remaining soil contamination exceeds 1 ppm PCBs.
  - Following EPA approval, backfilling the excavation with clean, imported backfill to match surrounding grades.
  - Collection of three post-construction baseline samples from the surface of the granular backfill material, from the same approximate northing and easting coordinates as bottom confirmation sample location numbers 1, 4, and 6 (Figure 7, Note 2).
- Third Quarter 2016: Stage 2 – Shored Excavation Area
  - Site restoration (Section 5.6).

Structural shoring in the form of an SSP enclosure will be installed to allow removal of PCB-contaminated soil to the target depth of Elevation -16 feet NAVD88 that is centered at the location of boring JF-DGP4 (refer to Figure 4). Excavation deeper than Elevation -16 feet NAVD88 is not anticipated but may be necessary in that location based on confirmation sample results collected when the target depths are reached. The remaining sections of this CMP Work Plan provide additional details regarding the individual work elements of the removal action as follows:

- Site Security
- Best Management Practices
- Survey Datum and Construction Layout
- SSP Installation
- Unshored Excavation
- Off-Site Excavation to Reduce Loads on the Existing 2-66 SSP Wall
- Shored Excavation
- Management and Removal of Settleable Solids
- Confirmation Sampling
- Post-Excavation Site Restoration
- Decontamination Procedures
- Management and Disposal of Liquid Wastes
- Management and Disposal of Solid Wastes
- Backfilling, Site Restoration, and SSP Removal

The Health & Safety Plan (HASP) for SoundEarth personnel observing and documenting the removal action is included in Appendix A. Preliminary construction haul routes and staging areas relative to the JFOS work area are shown on Figure 3.

5.1 SITE SECURITY

Security fences along the north and west sides of the JFC facility formerly intersected the footprint of the JFOS project, requiring partial removal to allow construction access to the JFOS project area. Access to portions of the JFOS project area must be coordinated in advance with security personnel at both facilities. In preparation for Stage 1, Unshored Excavation Area, the security perimeter was reconfigured around the east end of the JFOS construction work area using temporary fencing and connected to the Plant 2 perimeter fence. The reconfigured fencing established a single perimeter around the JFOS construction work area to discourage unauthorized access. During phases of active construction, the Owners and contractor will establish an Exclusion Zone and Contaminant Reduction Zone, in a secure area consistent with the HASP for pre-construction review by EPA. A separate Observation Zone will be established for observers. The plans and specifications will require the contractor to provide jobsite security to prevent unauthorized access.

5.2 BEST MANAGEMENT PRACTICES

The project design and specifications will require the contractor to implement and maintain best management practices (BMPs) for the duration of construction. Project plans and specifications will be made available for EPA review prior to the pre-construction meeting(s). The plans and specifications will require submittals from the selected contractor describing the contractor's recommended means and methods for responsibilities such as health and safety, erosion and dust control, the management of waste, decontamination, and containment and treatment of wastewater. The Owners will provide

contractor submittals to EPA for review. The objectives of the contractor's BMP responsibilities will be to:

- Establish and maintain erosion and sedimentation controls around the project perimeter.
- Control potential migration of contamination to and from the in-water portion of the adjacent JFEAA.
- Promote drainage of runoff toward controlled zones.
- Direct-load and otherwise contain excavated soil intended for off-site transport and disposal.
- Protect stockpiles of clean material from stormwater runoff, dust, erosion, and similar cross-contamination from construction activities.
- Decontaminate construction equipment in a controlled manner in accordance with the Decontamination Procedures in Appendix D, which set the regulatory standards for decontamination, and Section 5.7 of this CMP Work Plan. Specific equipment and procedures for decontamination will be in the contractor's HASP.
- Zero visible dust will be the objective for the project.
- Remove as much PCB-contaminated soil as possible by excavating in the dry (Section 5.5.3)
- Caulk SSP seams and line the excavation with plastic wrap, as a seepage control measure, prior to flooding the excavation and excavating in the wet (Section 5.5.3).
- Flocculate suspended sediment after excavating in the wet (Section 5.5.3).

The construction plans and technical specifications for the Shored Excavation Area will document and communicate Temporary Erosion and Sedimentation Control (TESC) and other BMP requirements to the contractor. Prior to mobilization, the selected contractor will prepare a preconstruction submittal describing means and methods of compliance with the TESC and other BMP requirements including the above-listed project objectives. The contractor will describe runoff control measures (e.g. silt fence, wattles, surface slopes), stockpile location and protection measures, and other housekeeping practices that minimize generation of waste or cross-contamination (e.g. ground protection, bucket swing direction, equipment footprints). The preconstruction submittal will be provided to EPA for review and comment prior to scheduling the Preconstruction Meeting(s) for the Shored Excavation to which EPA will be invited.

5.3 SURVEY DATUMS AND CONSTRUCTION LAYOUT

The horizontal datum for the JFOS removal action project is NAD83. The vertical datum for work performed under the Third Modification to the Order is NAVD88.

Construction layout for the JFOS removal action will coordinate with the alignment of the existing western SSP wall and the southwest concrete wing wall, as well as coordinate with the existing northern 2-66 SSP wall.

5.4 STAGE 1, UNSHORED EXCAVATION AREA

Removal action in the Stage 1, Unshored Excavation Area was completed in September 2015, as documented in the RACR for Stage 1 (SoundEarth 2016). Approximately 30 lineal feet of CMP and surrounding soil were removed without shoring, between the clay-to-CMP transition and the Stage 2

Shored Excavation Area (Figures 1 through 4). Within the Stage 1, Unshored Excavation Area Envelope, CMP and surrounding soils were removed to a depth corresponding to Elevation +7 feet NAVD88 using vertical trenches supported by trench boxes to remove the pipes. Simple potholing removed the shallow PCB-contaminated soil greater than 1 ppm found at location 2-66-SP-10 to a depth corresponding to Elevation +6 feet NAVD88. The removal of PCB-contaminated soil from the location of boring 2-66-SP-10 initiated the time-critical removal action (Figures 4 and 7).

5.4.1 Sidewall Configurations

Sidewalls were temporarily shored in accordance with state Trenching & Excavating requirements of Washington Administrative Code (WAC) Chapter 296-155 Part N. Removal of the CMPs was performed using a trench box to reduce the excavation footprint and minimize waste volumes. Steel plates were used at the east and west ends of the trench box to maintain soil stability. The relationship between the excavation envelope and the trench box excavation configuration is illustrated in plan view on Figure 4. Conceptual cross-section views through the Stage 1, Unshored Excavation Area are provided on Figures 5 and 6.

Excavation below the top of the groundwater table was not necessary; therefore, collection and management of construction dewatering water was not necessary. Excavated soil and waste CMP were managed and disposed in accordance with Section 5.9 and the RACR for Stage 1.

5.4.2 Confirmation Sampling

During excavation, a visual evaluation was made of the condition of the CMP and appearance of exposed soil surrounding the pipes. During previous phases of work, corrosion of the CMP and an oily or discolored appearance to the soil have been observed in association with contamination and detectable concentrations of PCBs. Discolored materials were removed.

Nine confirmation samples were collected from the two unshored excavation areas using the excavator bucket, at the approximate locations shown on Figure 7. Based on the conceptual site model of decreasing contaminant concentrations and affected area with increasing depth below the CMPs, four samples are justified for the larger of the two unshored excavations, which was approximately 500 square feet in area. This equates to each sample being representative of 125 square feet of excavation bottom, which is sufficient to adequately characterize post-excavation conditions. One bottom sample and 4 sidewall samples (5 total) are justified for the pothole excavation at boring 2-66-SP-10, which had an area of less than 50 square feet; the sidewalls of the targeted excavation were accessible, allowing the collection of confirmation samples from each of the four sidewalls.

The objective of confirmation sampling was to verify compliance with the 1 ppm cleanup level. In the event that the PCB concentration in any single confirmation sample inside an unshored excavation area exceeded the cleanup level of 1 ppm, then additional excavation was performed.

Planned easting and northing coordinates for the pothole excavation confirmation samples are summarized in Section 3.1 the Sampling and Analysis Plan (SAP)/Quality Assurance Project Plan QAPP) (Attachment E). Nominal variances from the planned confirmation sample locations are described in the RACR for Stage 1 (SoundEarth 2016).

- The planned confirmation sample locations in the pothole excavation included at least 5 samples corresponding to the anomalous detection of PCBs in boring 2-66-SP-10. The 5

samples included at least 1 sample at the bottom of the pothole and 1 from each pothole sidewall. Planned easting and northing coordinates for the pothole excavation confirmation samples are summarized in Section 3.1 the SAP/QAPP (Attachment E). Nominal variances from the planned confirmation sample locations are described in the RACR for Stage 1 (SoundEarth 2016).

- The planned confirmation sample locations in the trench box excavation consisted of 4 samples collected from directly beneath the CMPs at the approximate locations shown on Figure 7. Two samples were collected from underneath the 12-inch CMP and 2 samples were collected from underneath the 24-inch CMP. Each pair of bottom samples were spaced between 10 and 15 feet apart in the east-west direction with the objective of collecting one bottom sample from each of the 4 quadrants of the excavation footprint. During excavation, the conditions of both CMPs were noted (e.g. holes in CMP or discolored soil) and the alignments of both CMPs were visually confirmed; the initial 4 confirmation samples will be collected from under their respective, actual CMP alignments as revealed during excavation.

Survey control stakes identified fixed easting and northing coordinates in the field for reference during excavation and confirmation sampling activities. Confirmation sample locations were located in the field using taped measurements from a survey control stake, within plus or minus 1 foot of the planned coordinates.

Quality assurance and quality control samples will be collected in accordance with the SAP/QAPP (Appendix E). A preliminary data package will be submitted to EPA for timely review and approval prior to backfilling. Upon EPA approval, backfilling will commence in accordance with Section 5.6.

5.5 SHORED EXCAVATION

A 5-sided shoring enclosure will be constructed from 2 existing and 3 new SSP wall segments; the existing 2-66 SSP wall will form the north side of the shoring enclosure, and the existing SSP wall remaining from the JFEAA DMU 5 removal action will form the west side of the shoring enclosure. The footprint of the shoring enclosure, shown on Figures 1 through 4, encompasses the following historical sampling locations where PCB exceedances were deepest: borings JF-DGP1, JF-DGP2, JF-DGP3, JF-DGP4, JF-DGP5, and JF-DGS1.

The existing, western SSP wall is constructed from AZ38-section, 60-foot-long SSP stock with the tops situated between Elevations +12.4 and +12.6 feet NAVD88. The new SSP wall segments will also be constructed from 60-foot long, AZ38 SSP per the preliminary design drawings (Appendix B). The tops of the newly placed SSP will range between Elevations +13 and +18 NAVD88 to accommodate contractor operations.

Excavation deeper than -16 feet NAVD88 will be limited to some extent by deflection of the SSP. Forthcoming plans and specifications will require the monitoring of SSP deflection, require reduction of lateral pressures against the SSP (e.g. removal of vadose-zone backfill at Plant 2), and provide specifications on maintenance of water levels inside the SSP enclosure in a manner that manages deflection forces. Despite these monitoring and control measures, the SSP deflection values measured during construction will determine the safe limit for total vertical depth of the removal action at any given location. In the event that the results of confirmation sampling indicate that additional excavation

needs to be performed and the observed SSP deflection is at the limits of design tolerance, then an in-field engineering evaluation will take place.

Recommended courses of action will be communicated with EPA for concurrence to enable operation continuance. Alternate design information will be recorded and submitted as an addendum to this CMP Work Plan. The decision framework that articulates the relationship between PCB concentration thresholds and engineering-based decisions is presented above in Section 5.0.

5.5.1 2-66 Sheet Pile Wall Excavation

Engineering design of the shored excavation includes the temporary removal of soil behind the north side of the existing 2-66 sheet pile wall to relieve unbalanced loads on the 2-66 sheet pile wall during the JFOS shored excavation (refer to Figure 1). The excavation on the north side of the 2-66 sheet pile wall will be limited to the vadose zone above the groundwater table, approximately 10 feet below the top of the existing 2-66 sheet pile wall and for a horizontal distance of at least 10 feet north of the wall at the base of the cut. The open cut excavation will require side slopes of 1(H):1(V) for stability. The vadose zone soil to be temporarily removed from inside the 2-66 sheet pile wall was originally placed as clean sandy-gravel backfill following a removal action by Boeing as part of the Plant 2 RCRA Order. Prior to its original placement as backfill, samples of native soil from local quarries were collected and analyzed for petroleum, solvents, and eight total metals; the analytical results are included in Appendix F and confirmed the uncontaminated nature of the backfill when originally placed.

The excavated backfill will be stockpiled on Plant 2 and sampled for trichloroethylene (TCE) and its breakdown products to confirm suitability as backfill to the 2-66 sheet pile wall. The stockpiled backfill will be located at least 20 feet from the edge of the temporary cut slopes. This temporary excavation action will be within Plant 2, and will be coordinated with EPA RCRA personnel by Boeing in accordance with the Plant 2 RCRA Order.

The number of samples that will be collected from the backfill stockpile will depend on estimated volume of the stockpile. Three samples will be collected if the estimated stockpile volume is equal to or less than 100 cubic yards. Five samples will be collected if the estimated stockpile volume is between 101 and 500 cubic yards. Sampling and analysis protocols specific to Plant 2 and work under the RCRA Order are summarized in Appendix C and Appendix E.

5.5.2 Steel Sheet Pile Installation

The planned footprint of the JFOS shored enclosure is 5-sided, as shown on Figure 4 and the preliminary design (Appendix B). Two sides already are in place, and 3 new sides will be installed to create the shored enclosure:

- The western segment of the JFOS shored enclosure was installed under the Second Modification using the same size and gauge panels as the new segments; new segments will connect with the splines of the existing western segment.
- The existing 2-66 sheet pile wall will serve as the north segment of the new enclosure. New segments of the JFOS SSP enclosure will be installed as close as practicable to the existing 2-66 sheet pile wall, without damaging or deflecting the existing 2-66 sheet pile wall.

- The new JFOS SSP walls will be connected to the existing 2-66 wall by augering two pairs of 24-inch-diameter columns adjacent to the 2-66 sheet pile wall from the ground surface to approximately Elevation -40 feet NAVD88 as shown in Appendix B. The augered columns will overlap in accordance with the technical specifications. The augered columns will be grouted with lean concrete mix or controlled density fill to the ground surface and the connecting JFOS SSP panels will be installed through the grouted columns. This procedure will create a barrier restricting water flow into or out of the sheet pile enclosure.

5.5.3 Excavation Steps Above and Below the Water Table

Excavation inside the JFOS shored enclosure will proceed in steps, as illustrated in cross-section view on Figure 5. When transitioning from Subtitle D to Subtitle C soil conditions, materials will be transferred without comingling to a different lined dump truck or lined roll-off container (i.e. with a Subtitle C manifest instead of a Subtitle D manifest).

Different excavation and water management protocols will apply to Steps 1 through 3 as follows:

1. **Excavation of Subtitle D Soil** - Soil above the tops of the CMPs are also above the groundwater table. These soils will be direct-loaded into roll-off containers or dump trucks and transported to a permitted Subtitle D landfill, or permitted transfer facility, for disposal.

2. **Excavation in the Dry** – Soil at and below the tops of the CMPs contains Subtitle C soil at PCB concentrations greater than 50 ppm. Soils removed during the second step of excavation inside the JFOS shored enclosure will be direct-loaded into lined roll-off containers, or lined dump trucks, and transported to a permitted Subtitle C landfill for disposal. The majority of the Subtitle C soils are situated below the groundwater table. To control the groundwater table and minimize the water content in Subtitle C-level soils, excavation will continue "in the dry" to approximate Elevation -5 feet NAVD88, by dewatering the excavation. Targeted excavation will continue deeper than Elevation -5 feet NAVD88 at the locations of borings T2B4 and JF-DGP6, near the center of the JFOS shored enclosure, to remove as much Subtitle C soil as practicable in the dry to an approximate Elevation -5 feet NAVD88. Groundwater will be pumped out using conventional pumps, and managed in accordance with Section 5.8. During excavation in the dry (Step 2), the SSP seams will be visually inspected for signs of seepage entering the excavation area from DMU 5, and the SSP seams will be caulked above Elevation -5 feet NAVD88. Prior to proceeding with excavation in the wet (Step 3), the exposed interior surfaces of the SSP will be lined with construction-grade plastic sheeting, to minimize if not eliminate potential loss of water through the SSP seams after the excavation has been flooded for Step 3.

3. **Excavation in the Wet** - Following Step 2 above, the excavation will be flooded with potable water to Elevation +10 feet NAVD88 prior to advancing the remainder of the excavation to the target depth of Elevation -16 feet NAVD88. Flooding is necessary to prevent excessive deflection of the 2-66 sheet pile panel as well as the AZ38 SSPs. Intermittent pumping may be required to balance water levels with soil

removal volumes; refer to Section 5.8 regarding management of construction dewatering water. Plans and specifications will be provided to and coordinated with EPA to require the contractor to wait until drainage transitions from steady flow to drips from the bucket prior to swinging to and unloading in a lined dump truck or roll-off container. If pooled water accumulates inside the lined dump trucks or roll-off containers, the time interval for drainage may be adjusted and/or a lined roll-off container may be staged for treatment with lime or other absorbent, as necessary.

Upon completion of this step of removal, the bottom of the shored excavation will be bowl-shaped with the approximate center slightly deeper than the perimeter, as shown on Figures 4 and 5.

Once the initial target depth of Elevation -16 feet NAVD88 has been achieved, excavation activity will cease, and suspended solids will be allowed to settle out of the water column, prior to the collection of confirmation samples. Removal and management of settleable solids, including the option to add flocculating agents, are described in Section 5.5.4. Removal and management of construction dewatering water is described in Section 5.8.

5.5.4 Management of Settleable Solids

Excavation in the wet during Step 3 inside the shored enclosure could result in suspension of solids and subsequent re-settling of PCB-containing solids in the base of the excavation. To minimize settleable solids entrained in the water column, the following steps will be taken:

1. Remove soils above the CMP and manage in accordance with Section 5.9.
2. Prior to excavating in the wet, dewater the shored enclosure and target the removal of soils with the higher PCB concentrations.
3. Initiate protocols for excavating in the wet, and advance the excavation inside the shored enclosure to approximate Elevation -9 feet NAVD88.
4. Allow solids to settle for at least 24 hours prior to deepening excavation. A flocculation agent may be added to decrease settling times.
5. Advance the excavation inside the shored enclosure to Elevation -16 feet NAVD88 while maintaining the specified water level in the enclosure.
6. Allow solids to settle for at least 24 hours prior to collecting confirmation samples.
7. If confirmation samples fail, a vacuum dredge may be deployed to remove settleable solids from the bottom of the excavation, depending upon the results of confirmation sampling.

5.5.5 Confirmation Sampling

Confirmation sampling inside the JFOS shored enclosure will not proceed until settleable solids have been managed in accordance with the protocols provided in Section 5.5.4. Confirmation samples will be collected from the bottom of the shored excavation and analyzed for PCBs for comparison with the cleanup level of 1ppm. Six samples will be collected from the upper 6 inches of soil/solids lying at the bottom of the shored excavation, at the approximate locations shown on Figure 7, using a clamshell-type sampling device (e.g. Van Veen sampler).

The northern tier of three confirmation samples (east, middle, and west locations 1, 2, and 3 on Figure 7) will be collected underneath the projected alignment of the 12-inch CMP (northing of 195805 feet). The rationale for the east-west spacing of confirmation sample nos. 1, 2, and 3 is as follows:

- Confirmation sample location no. 3 will be collected from the approximate location of boring JF-DGP3, where the deepest exceedance of PCBs was documented at Elevation -15 feet NAVD88. Confirmation sample no. 3 is intended to confirm that the cleanup level of 1 ppm is met at the location of boring JF-DGP3 and at the deepest target elevation from the shored excavation (Elevation -16 feet NAVD88).
- Confirmation sample location no. 1 will be positioned underneath the projected alignment of the 12-inch CMP. Confirmation sample no. 1 is intended to confirm that the cleanup level of 1 ppm is met west of boring JF-DGP2.
- The bottom of the shored excavation will rise 20 vertical feet between boring locations JF-DGP2 and JF-DGP3. Confirmation sample location no. 2 will be positioned underneath the projected alignment of the 12-inch CMP approximately halfway between confirmation sample location nos. 1 and 3. Confirmation sample no. 2 is intended to confirm that the bowl-shaped bottom configuration of the excavation is deep enough to meet the cleanup level of 1 ppm between boring locations JF-DGP2 and JF-DGP3.

The southern tier of three confirmation samples will be aligned parallel to the long axis of the bottom of the shored excavation shown on Figure 3. The rationale for confirmation sample locations 4, 5, and 6 is as follows:

- The bottom of the shored excavation will rise 30 vertical feet between borings JF-DGP3 and JF-DGS2 and T2B3. Confirmation sample location no. 4 will be positioned between 5 and 10 feet southeast of boring JF-DGP3. Confirmation sample no. 4 is intended to confirm that the bowl-shaped bottom configuration of the excavation is deep enough to meet the cleanup level of 1 ppm between boring locations JF-DGP3 and JF-DGS2 and T2B3.
- Confirmation sample location no. 5 will be located southwest of boring JF-DGP4, between 10 and 15 feet away from confirmation sample location no. 4. Confirmation sample no. 5 is intended to confirm that the bowl-shaped bottom configuration of the excavation is deep enough to meet the cleanup level of 1 ppm between borings JF-DGP4 and JF-DGP5.
- Confirmation sample location no. 6 will be located west of boring JF-DGP5, between 10 and 15 feet away from confirmation sample location no. 5. Confirmation sample no. 6 is intended to confirm that the bowl-shaped bottom configuration of the excavation is deep enough to meet the cleanup level of 1 ppm west of boring JF-DGP5.

Proposed easting and northing coordinates for the shored excavation confirmation samples are summarized in Section 3.1 of the SAP/QAPP (Attachment E). Survey control stakes will identify fixed easting and northing coordinates in the field for reference during excavation and confirmation sampling activities. Confirmation sample locations will be located in the field using

taped measurements from a survey control stake, within plus or minus one foot of the listed coordinates. Additional excavation, if necessary for removal action compliance, will be followed by additional confirmation sampling where necessary.

Quality assurance and quality control samples will be collected in accordance with the SAP/QAPP, which is included as Appendix E of this CMP Work Plan. A validated data submittal package will be submitted to EPA for timely review. Upon EPA approval, backfilling will commence in accordance with Section 5.6.

5.6 SITE RESTORATION AND POST-CONSTRUCTION BASELINE SAMPLING

Different backfilling procedures apply to the Stage 1, Unshored and Stage 2, Shored Excavation Areas, including below and above the water table in the shored enclosure. Backfilling of the Stage 1, Unshored Excavation Areas is described in the RACR for Stage 1 (SoundEarth 2016).

While backfilling inside the Stage 2, Shored Excavation Area, water levels will be monitored and adjusted to prevent overflows. All water removed from the shored enclosure during the backfill phase will be contained and managed in accordance with Section 5.8. The rate of backfill placement inside the shored enclosure will not exceed the pumping capacity for water removal and treatment. Clean, granular backfill will be used above and below the groundwater. Engineering design specifications will specify the maximum acceptable lift thickness and minimum compaction standard.

The first lift of backfill inside the shored enclosure will be placed gently in a manner that stabilizes the bottom of the excavation. Additional backfill will be placed inside the shored enclosure at a rate slower than the capacity of the pumps and water treatment system, until the backfill elevation is above the water level. Above the water level, backfill will proceed in the dry.

Once each excavation area has been backfilled to final grade, post-construction baseline samples will be collected from the surface of the granular backfill material and analyzed for PCBs in accordance with the SAP/QAPP. Two post-construction baseline samples will be collected from the trench box portion of the Stage 1, Unshored Excavation Area, one will be collected from the spot excavation portion of the Stage 1, Unshored Excavation Area. Three post-construction baseline samples will be collected from the Stage 2, Shored Excavation Area. The bottom confirmation sample location numbers 1, 4, 6, 9, 10, and 11 shown in Figure 7 and indicate the planned locations of the post-construction baseline soil samples. Section 3.1 of Appendix E provides approximate northing and easting coordinates for all 6 post-construction baseline samples).

Perimeter security fencing for the JFC and Plant 2 properties will be installed following final site grading. The timing and scope of SSP removal will depend upon completion of the JFOS removal action project and adjacent in-water work.

5.7 DECONTAMINATION PROCEDURES

Re-useable equipment and materials will be decontaminated in accordance with Section 761.79 of the Code of Federal Regulations and under the regulatory framework described in Appendix D, which was approved by EPA to decontaminate the SSP removed as part of EMJ's removal action work encompassing DMU 5. The procedures, standards, and objectives presented in Appendix D and summarized in this section apply to SSP as well as re-useable and non-reusable equipment and

materials. Forthcoming plans, specifications, and contractor submittals will address different decontamination standards, if any, that apply to the conditions anticipated during implementation:

- Non-disposable equipment, structures, and personal protective equipment, will be decontaminated using mechanical means or pressure washing to achieve a "clean debris surface" as defined in 40 C.F.R. §761.79 (h)(1). As described below in this section, the facility has demonstrated "after the fact" that the proposed method is capable of decontaminating the material to the applicable level set out in 40 C.F.R. §761.79 (b)(1) through (b)(4).
- All vehicles and equipment leaving the work site will be visually inspected to ensure that they are clean and meet the "clean debris surface" standard prior to leaving the site.
- The standard defined in §761.79(c)(2)(i) for moveable equipment (swabbing with solvent, such as CAPSUR) will apply to any black stain areas (e.g. near the former top inside ends of the SSP panels, should the panels be removed at the end of the project).
- All reusable equipment (e.g. temporary shoring, water pumps, boots, etc.) will be decontaminated in accordance with the above-listed standards and objectives.
- All non-reusable equipment (e.g. light duty gloves, tyvek, etc.) and solid decontamination process wastes and disposable wastes will be disposed of in a Subtitle D facility pursuant to 40 CFR §761.79 (g). Non-reusable equipment and decontamination process wastes will be contained for off-site transport and disposal at a Subtitle D disposal facility.
- In the event that any excavation sequence reverts from Subtitle C to Subtitle D conditions, equipment and materials that came in contact with Subtitle C conditions will be decontaminated prior to proceeding with excavation in Subtitle D conditions.
- The contractor will designate a decontamination work zone on JFC Property inside the paved staging area. The decontamination work zone will be will be formally secured with temporary fencing and signage to communicate work zone access and egress conditions, and equipped with disposable PPE and a temporary hand-wash and boot-wash unit. Workers will wash their hands and faces after removing their PPE and before they leave the work area.
- Decontamination of equipment inside the exclusion zone to achieve the "clean debris surface" standard (pressure washing or mechanical means) may be performed over the excavation.

Between August 10 and 13, 2015, extracted SSP panels were decontaminated inside a secure, designated work zone located east of the Black Shack (Figure 3). Sandy material was brushed or chiseled from the lower portions of each SSP panel and splines. CAPSUR® was applied to the black-stained zone on the upper portions of each SSP panel. Following decontamination, a numbered label was fastened to each decontaminated SSP panel. Currently, the decontaminated SSP panels are staged within the construction staging area (Figure 3) in preparation for future re-use.

5.8 MANAGEMENT AND DISPOSAL OF LIQUID WASTES

Any wastewaters generated will be contained and disposed in accordance with applicable regulations. Appropriate means of disposal are treatment and discharge to King County Wastewater Treatment Division sanitary sewer (METRO) in accordance with a temporary industrial waste discharge permit, and/or collection in a vactor truck for direct transport to a permitted disposal facility. Forthcoming

plans, specifications, and contractor's preconstruction submittals will include the configuration and sizing of a temporary treatment system for permitted discharge to METRO sewer. Details coordinated in conjunction with the forthcoming King County METRO discharge permit will include sampling and analysis of treated effluent. Analytical methods, sample container details, quality assurance and quality control limits for potential effluent sampling parameters are included in the SAP/QAPP (Appendix E).

As an alternative or in addition to treatment and discharge of waste water to METRO, waste water may be collected by vactor truck for disposal at a permitted disposal facility in proximity to the JFOS project, such as Emerald Services or Waste Management, both in Seattle, Washington.

Prior to mobilization, the selected contractor will prepare a preconstruction submittal describing means and methods of water containment, treatment, and disposal that complies with applicable regulations, and the project plans and specifications. A temporary treatment system typically includes, at a minimum, a settling tank, followed by liquid-phase activated carbon (or equivalent alternative) treatment vessels with a contingency backup carbon vessel, and discharge plumbing to the sanitary sewer. The contractor's submittal will be provided to EPA.

5.9 MANAGEMENT AND DISPOSAL OF SOLID WASTES

The planned removal action is expected to generate waste soil, CMP, and other solids such as personal protective equipment (PPE) and plastic sheeting. Soil removed at elevations at and above the top elevation of the CMPs will be excavated and managed separately from soil removed below the CMP.

- Soil excavated above the top elevation of the CMPs and above the groundwater table will be direct-loaded into roll-off containers or dump trucks and transported for disposal as Subtitle D waste at a permitted landfill.
- Subtitle C CMP and soil excavated below the tops of the CMP, and settleable solids that are recovered from wastewater management and excavation in the wet, will be direct-loaded into lined roll-off containers or dump trucks. As a contingency, lined roll-offs may be staged close to the excavating equipment for containment and treatment of saturated soils. If pooled water accumulates inside the lined dump trucks or roll-off containers, saturated soils may be treated with lime or other absorbent, as necessary. Subtitle C materials will be transported for disposal as Subtitle C waste at a permitted landfill.
- All dump truck and roll-off loads must be covered for offsite transport.
- Other non-reusable solids, such as disposable PPE and used plastic sheeting, will be contained for off-site transport and disposal at a Subtitle D disposal facility in accordance with 40 CFR §761.79 (g).
- The project plans and specifications will require that the contractor identify permitted Subtitle D and Subtitle C disposal facilities where project-generated wastes will be disposed under manifest. The Owners will identify the disposal facilities for EPA review.

6.0 PERFORMANCE CRITERIA

The following performance criteria will be used to evaluate successful completion of the work described in this CMP Work Plan:

- Installation of SSP shoring in accordance with the design configuration and sufficient embedment depth to allow the safe removal of PCB-contaminated soil to the target depth corresponding to Elevation -16 feet NAVD88 (or potentially deeper if required following confirmation sampling).
- Compliance with the cleanup goal of 1 ppm, based on the results of confirmation sampling from the bottom of excavation.
- Post-construction sampling of the backfilled excavation surface.
- Pre- and post-construction sampling for PCBs in bank material west of the existing SSP (outside the western boundary of the JFOS site), to evaluate performance of seepage control measures undertaken during removal action inside the shored excavation area.
- Restoration of site grades consistent and compatible with surrounding grades to the satisfaction of the Owners.
- Compliance with the contractor's HASP.
- Compliance with the SAP/QAPP, which is included with this CMP Work Plan as Appendix E.

7.0 ANTICIPATED TIMELINE AND KEY MILESTONES

The Stage 1, Unshored Excavation was initiated on September 14, 2015 and completed on September 23, 2015. The RACR for Stage 1 was submitted to EPA on January 13, 2016. The following anticipated timeline and key milestones for the CMP work apply to Stage 2:

Milestone	Timeline
Submittal of Draft Corrugated Metal Pipe (CMP) Work Plan	August 14, 2015
Submittal of Final CMP Work Plan following receipt of EPA's October 29, 2015 comments on the Draft CMP Work Plan	January 21, 2016
Prepare Construction Plans and Technical Specifications (including Best Management Practices) for Stage 2, Shored Excavation Area	90 Days after EPA Approval of the Final CMP Work Plan
Finalize Construction Plans and Technical Specifications	30 Days after EPA Issues Comments on the Construction Plans and Technical Specifications
Bidding and Contractor Selection	30 Days after Plans and Specifications are Final
Preconstruction Meeting(s) and Contractor Submittals for Stage 2 – Shored Excavation Area Scope of Work including with EPA oversight representatives	At Least One Week Prior to Contractor Mobilization
SSP Installation Followed by Removal Action in the Shored Excavation Area	60 Days after Contractor Selection
Begin Site Restoration	Upon EPA Approval to Backfill Shored Excavation and Backfill Plant 2 2-66 Sheet Pile
Submit Draft Removal Action Completion Report	60 Days after Completion of Site Restoration

Milestone	Timeline
(RACR) to EPA	
Final RACR	30 Days after EPA Issues Comment on the Draft RACR

8.0 PROJECT ORGANIZATION

The project is located at the hub of several in-water and upland removal action projects, each of which is subject to a different state or federal jurisdiction.

8.1 AGENCY LEAD PERSONNEL

The Jorgensen Forge Outfall Site project is subject to the CERCLA regulatory framework. Mr. Ravi Sanga is EPA Region 10's Remedial Project Manager overseeing the completion of investigation and removal actions proceeding under the Third Modification.

The west- and south-adjacent JFEAA Removal Action is subject to EPA jurisdiction and CERCLA regulatory framework. Ms. Rebecca Chu is EPA Region 10's Remedial Project Manager overseeing the completion of LDW investigation and removal actions proceeding under CERCLA.

On-going investigation and removal actions at Plant 2, including the north-adjacent Boeing RCRA Corrective Action project, are subject to EPA jurisdiction under RCRA. Ms. Holly Arrigoni is EPA Region 10's Remedial Project Manager overseeing the completion of actions proceeding at Plant 2 under the RCRA Order.

Ms. Romy Freier-Coppinger is Washington Department of Ecology's case manager overseeing the Remedial Investigation for the south-adjacent upland portions of the Jorgensen Forge Property under Enforcement Order between Ecology and JFC.

8.2 JFC LEAD PERSONNEL

JFC, the current owner of the Jorgensen Forge Property, is jointly responsible with Boeing for implementation of this CMP Work Plan and fulfillment of the terms and conditions of the Third Modification between JFC, Boeing, and EPA. JFC's interests are represented by the following personnel:

- Mr. Miles Dyer is JFC's Director, Environmental Compliance.

8.3 BOEING LEAD PERSONNEL

Boeing, the current owner of the Plant 2 property, is jointly responsible with JFC for implementation of this CMP Work Plan and fulfillment of the terms and conditions of the Third Modification between JFC, Boeing, and EPA. Boeing's interests are represented by the following personnel:

- Mr. William Ernst, EO&T, EHS, of Boeing is the manager for RCRA Correction Actions activities conducted at Uplands Areas of Plant 2.

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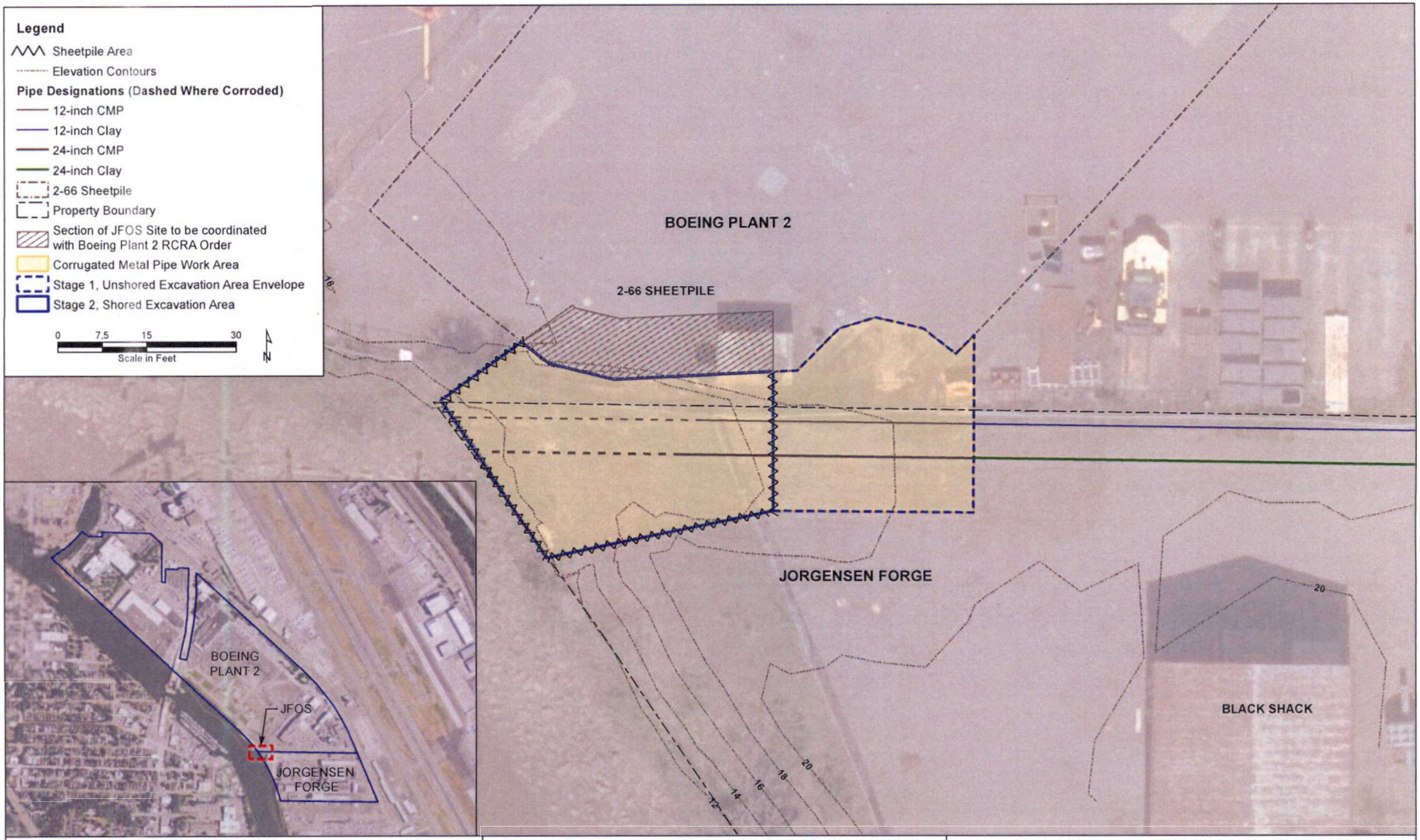
Washington Department of Ecology (Ecology). 2011. *Guidance for Remediation of Petroleum Contaminated Sites, Ecology Publication No. 10-09-057*. September.

FIGURES



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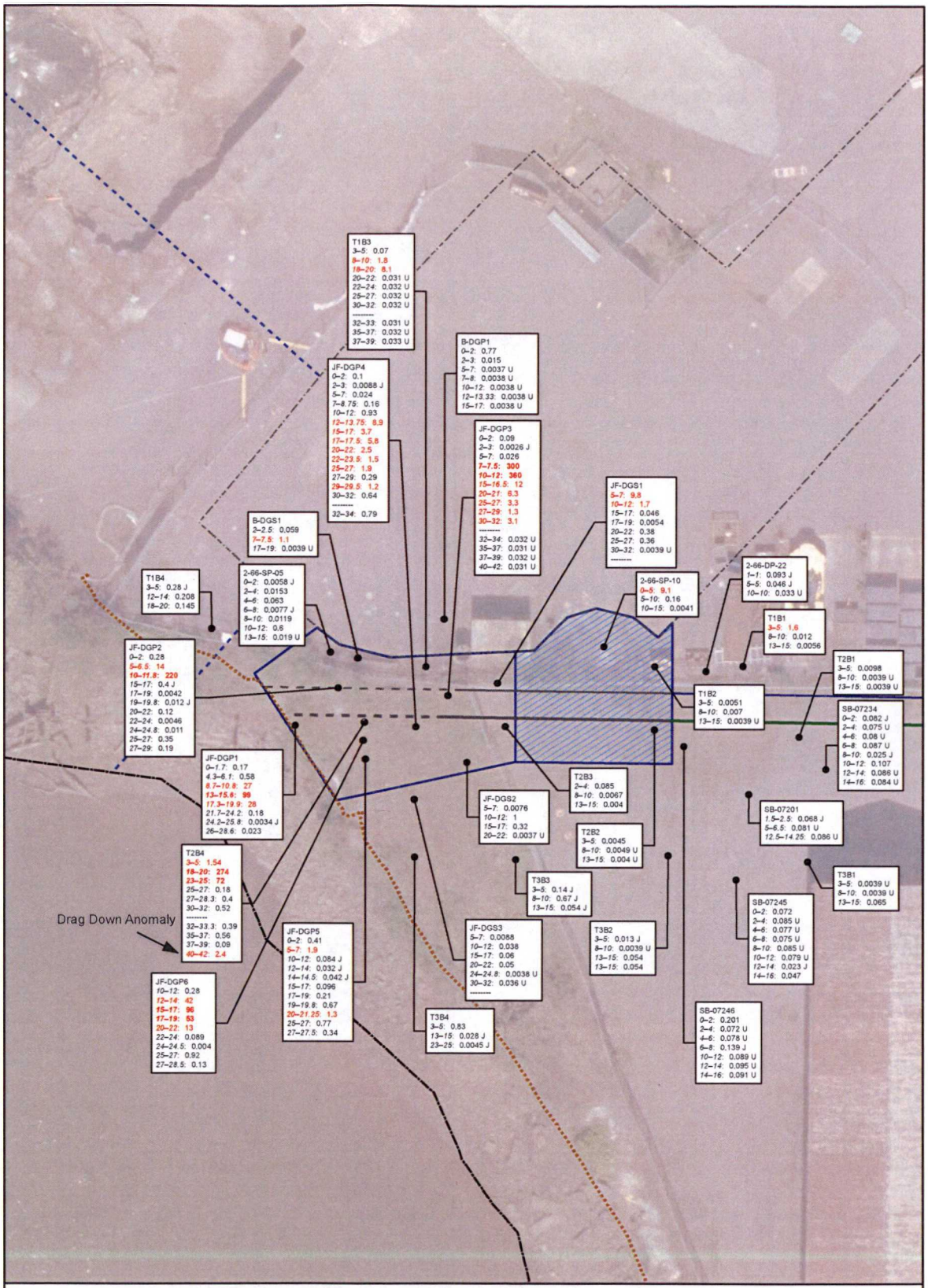
Jorgensen Forge Outfall Site
Seattle, Washington
CERCLA Docket No. 10-2011-0017

Figure 1
Boundary, Topography, and Existing Site Features Map

I:\GIS\Projects\BOE-PL2\MXD\JFOS\RAWP\Figure 1 Boundary Topography and Existing Site Features.mxd
1/21/2016



Legend

- Sample Locations
- Southwest Bank Corrective Measure Boundary
- DSOA Corrective Measure Boundary
- Top of Bank Location
- Stage 1, Unshored Excavation Area
- Stage 2, Shored Excavation Area
- 2-66 Sheetpile Envelope

Pipe Designations (Dashed Where Corroded)

- 12-inch CMP
- 12-inch Clay
- 24-inch CMP
- 24-inch Clay

0 20 Scale in Feet

Notes:
- **Red** results exceed 1 ppm.
- **Red bold** results exceed 50 ppm.
- -------- designates the base of excavation.
- Locations show the highest detect value or lowest non-detected value per depth range named in data frame heading.
- Orthoimage provided by USGS and dated 2009.

Abbreviations
- bgs = Below ground surface
- CMP = Corrugated metal pipe
- ppm = Parts per million

Location Name → T3B2
3–5: 0.013 J
8–10: 0.0039 U
13–15: 0.054
13–15: 0.054

Depth Range (Feet bgs) | Results and Qualifier (ppm)

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Figure 2
Total PCBs Concentrations in Soil
Historical and Current Data (1992–2012)

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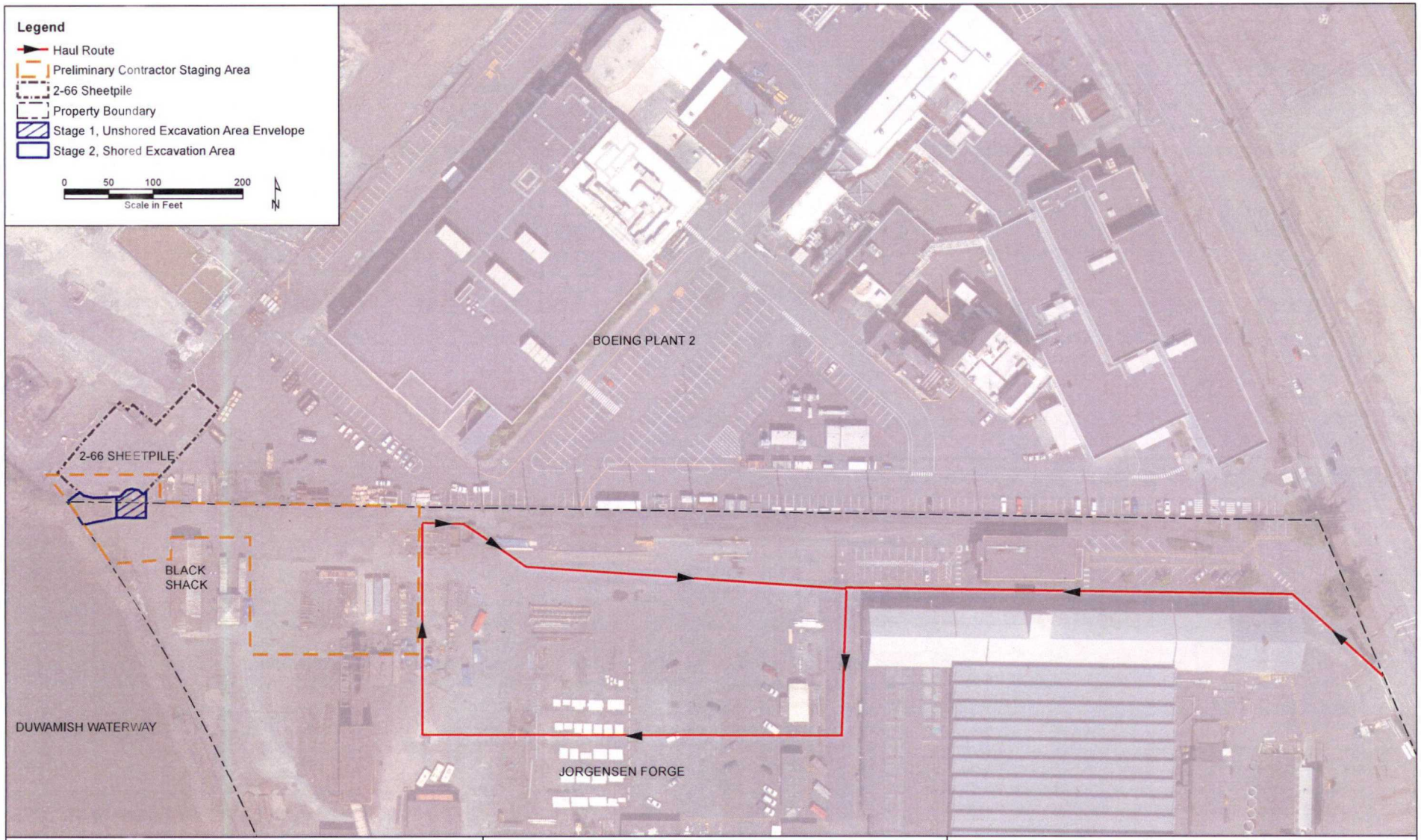

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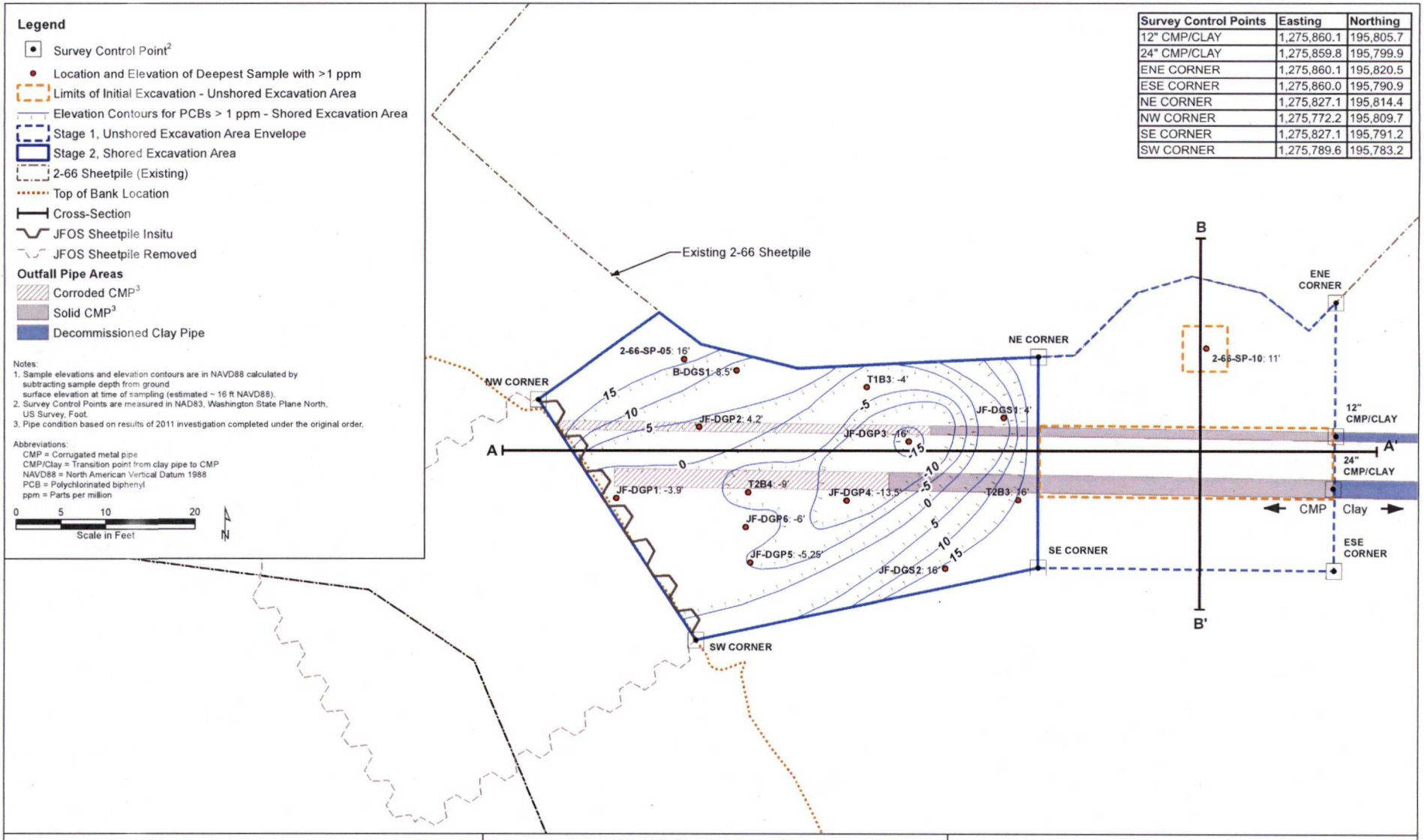
Figure 3
Construction Staging Area and Haul Route Schematic Map

I:\GIS\Projects\BOE-PL2\MXD\JFOS\RAWP\Figure 3 Construction Staging Area and Haul Route Schematic.mxd
1/21/2016



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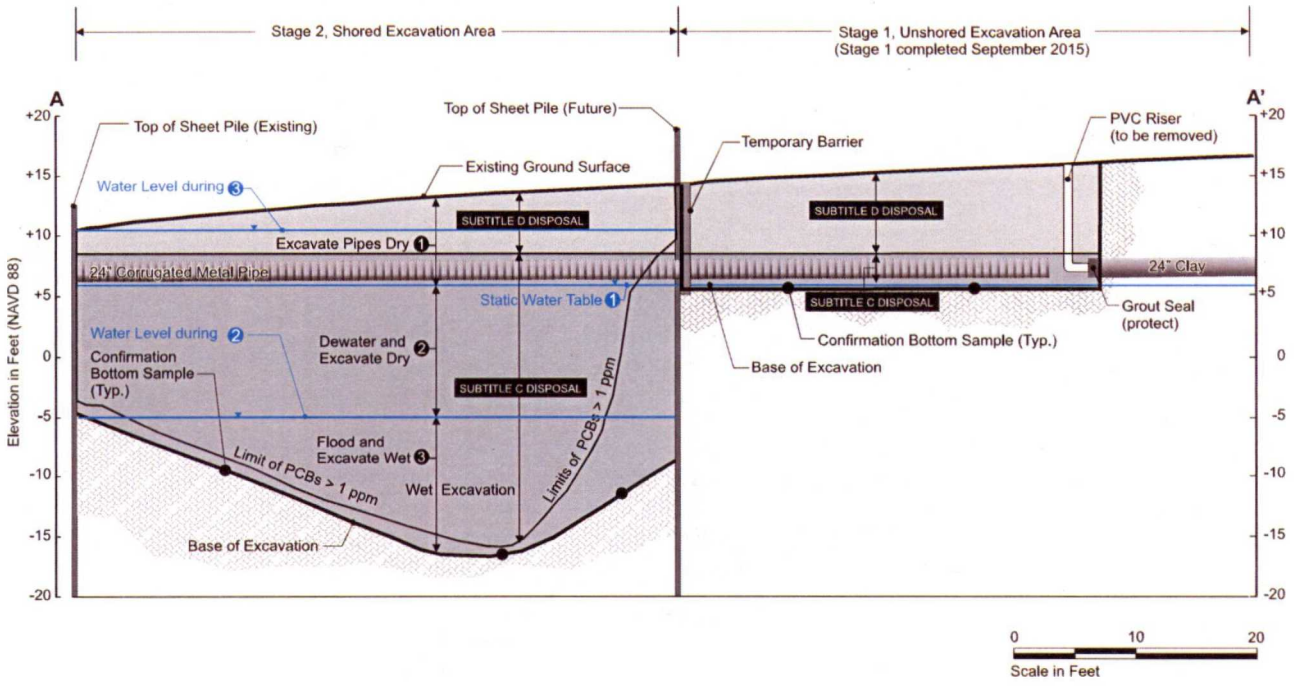
Seattle, Washington
CERCLA Docket No. 10-2011-0017

Figure 4
Deepest Elevation of Exceedance of PCB > 1 ppm
in Stage 2, Shored Excavation Area

I:\GIS\Projects\BOE-PL2\MXD\JFOS\RAWP\Figure 4 Deepest Elevation of Exceedance.mxd
1/21/2016



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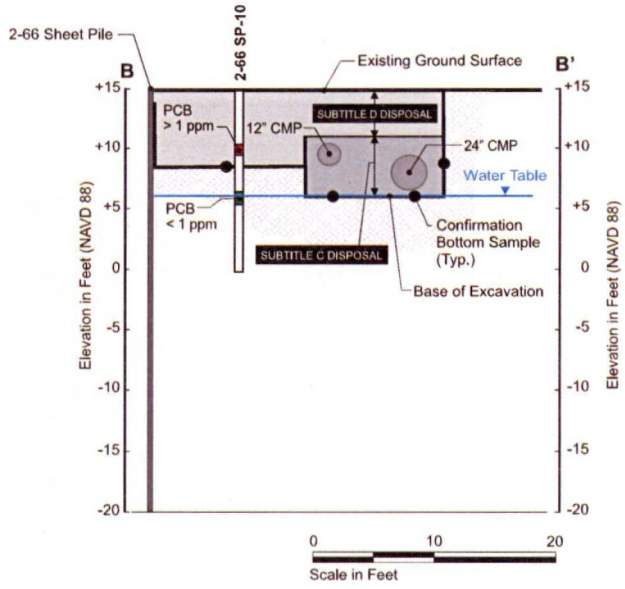
Jorgensen Forge Outfall Site
Jorgensen Forge/Boeing Plant 2
Tukwila, Washington

Figure 5
Cross Section A-A'
Stage 1 Unshored and Stage 2 Shored Excavation Areas



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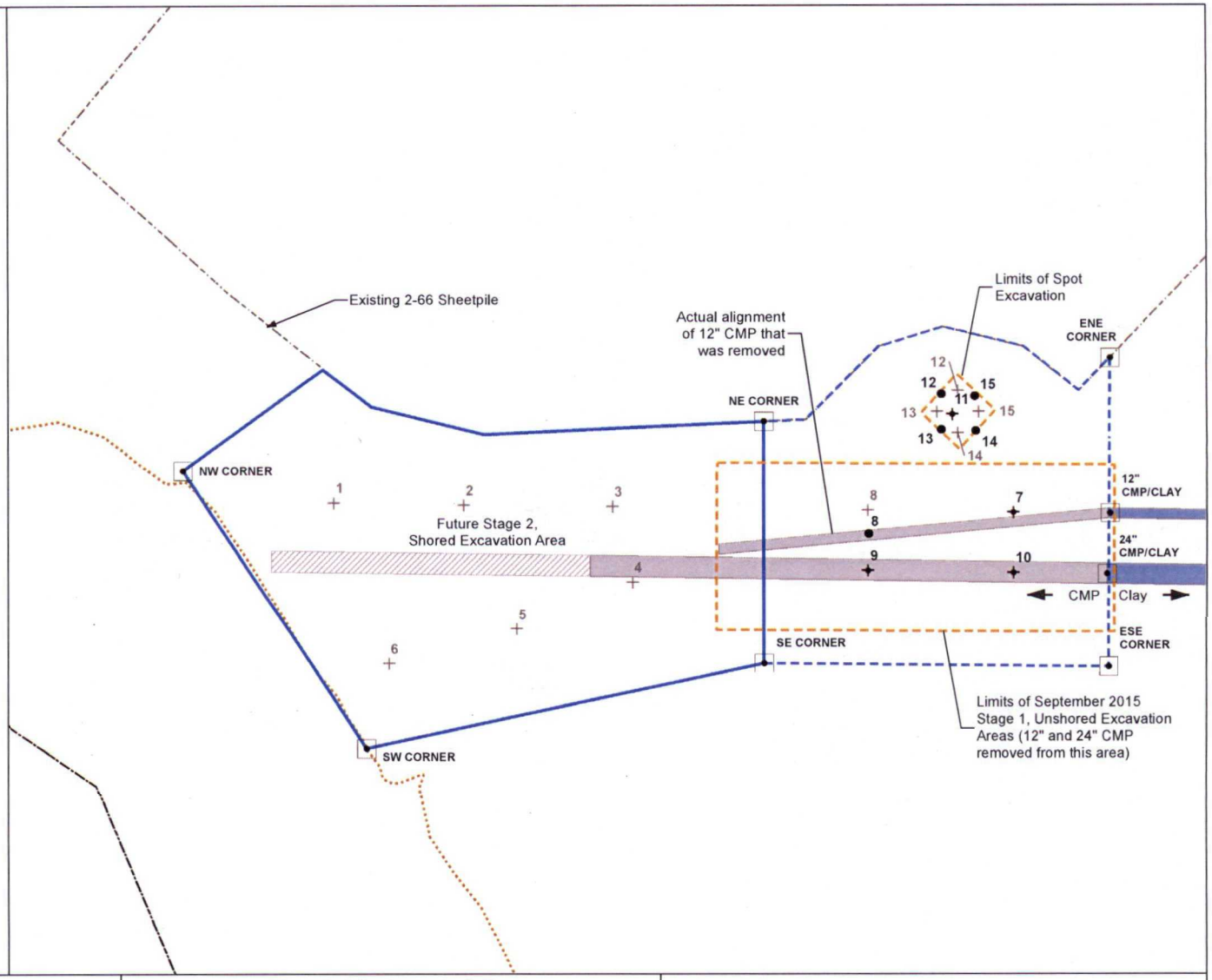
Jorgensen Forge Outfall Site
Jorgensen Forge/Boeing Plant 2
Tukwila, Washington

Figure 6
Cross Section B-B'
Stage 1, Unshored Excavation Area



Legend

- Survey Control Point [1]
- 8 Actual
- 1 Planned
- 7 Planned and Actual
- Stage 1, Unshored Excavation Area Envelope
- Stage 2, Shored Excavation Area
- 2-66 Sheetpile (Existing)
- Limits of Unshored Excavation Areas
- Top of Bank Location

Outfall Pipe Areas

- Corroded CMP[2]
- Competent CMP[2]
- Decommissioned Clay Pipe

Notes:
1 North American Datum 1983, Washington State Plane Coordinate System, North Zone (feet). Survey control points marked by Axis Survey & Mapping, 2015, Jorgensen Forge Facility, Excavation Exhibit, September 12.
2. Pipe condition based on results of 2011 investigation completed under the original order.
3. Post-construction baseline samples will be collected from the restored surface of the excavation backfill material at the same mapped locations as excavation bottom sample numbers 1, 4, 6, 9, 10, and 11 (samples were collected from locations 9, 10, and 11 in September 2015).
4. Elevations relative to North American Vertical Datum, 1988.

Abbreviations:
ft = Feet
CMP = Corrugated metal pipe
CMP/Clay = Transition point from clay pipe to CMP

Approximate Elevation[4] of Confirmation Samples		
Location Number	Elevation (Planned)	Elevation (Actual)
1	5	Future
2	0	Future
3	-15	Future
4	-4	Future
5	-7	Future
6	2	Future
7	+6	+6
8	+6	+6
9	+6	+5
10	+6	+5
11	+8	+6
12	+13	+7
13	+11	+7
14	+13	+7
15	+11	+7

0 5 10 20
Scale in Feet

N

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Jorgensen Forge Outfall Site
Seattle, Washington
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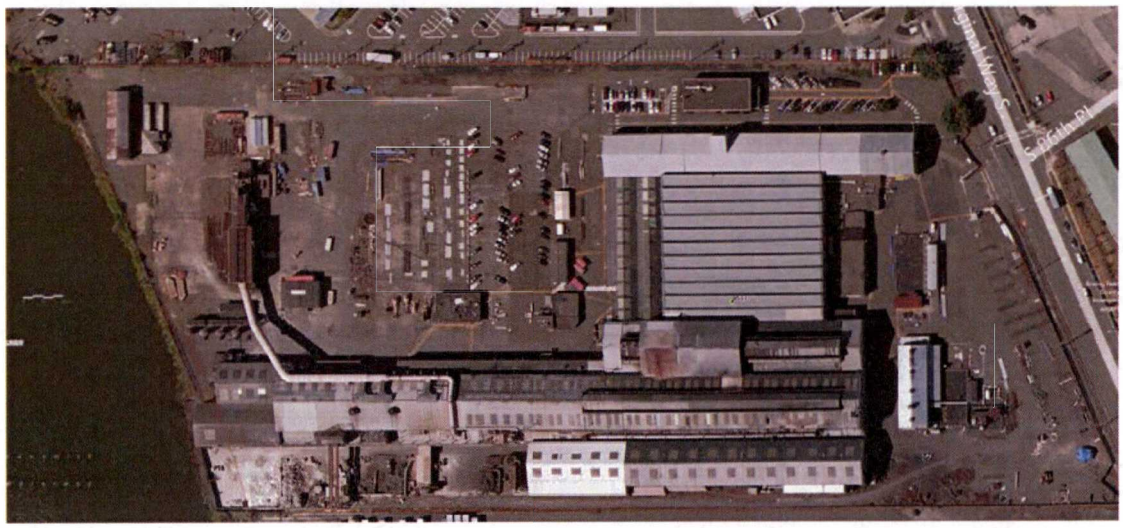
Figure 7
Limits of Excavation and Confirmation Sample Location Map

I:\GIS\Projects\BOE-PL2\MXD\JFOS\RAWP\Figure 7 Limit of Excavation and Confirmation Sample Location Map.mxd
1/21/2016

APPENDIX A
SOUNDEARTH HEALTH AND SAFETY PLAN

SoundEarth Strategies, Inc.
2811 Fairview Avenue East, Suite 2000
Seattle, Washington 98102

SITE-SPECIFIC HEALTH AND SAFETY PLAN



Project:
Jorgensen Forge Outfall Site
8531 East Marginal Way South
Seattle, Washington

CERCLA Docket No. 10-2011-017

Prepared for:
Jorgensen Forge Corporation
8531 East Marginal Way South
Seattle, Washington

Initiation Date: January 21, 2016
Expiration Date: January 20, 2017

HAZARD SUMMARY

SoundEarth Strategies, Inc. has prepared this Site-Specific Health and Safety Plan for removal action scheduled at the Jorgensen Forge Outfall Site (JFOS), located at 8531 East Marginal Way South in Seattle, Washington. Specifically, this HASP applies to SoundEarth personnel performing oversight of removal action activities described in the *Corrugated Metal Pipe Work Plan* prepared in response to the *Third Modification to Administrative Order on Consent for the Removal Action, Comprehensive Emergency Response, Compensation, and Liability Act (CERCLA) Docket No. 10-2011-0017* (Third Modification; EPA 2015). Project plans and specifications will require the selected removal action contractor to prepare a HASP for workers performing the work.

The Site-Specific Health and Safety Plan (HASP) was written in general accordance with the Washington State Model Toxics Control Act as promulgated in Chapter 173-340-350 of the Washington Administrative Code and Title 29 of the Code of Federal Regulations, Part 1910.120(b).

SITE DESCRIPTION

The JFOS project encompasses less than one-quarter acre at the northwest corner of the 20-acre JFC Property, adjacent to the Lower Duwamish Waterway (Figure 1). The JFC Property is currently used for metal forging and machining.

FIELD ACTIVITIES

SoundEarth's field responsibilities include the following activities:

- Collection of soil and water samples
- Measuring, mapping and layout
- Observation of construction tasks, including but not limited to:
  - Setting up fencing
  - Demolition
  - Construction of a decontamination compound
  - Decontamination of construction materials and equipment
  - Drilling and augering
  - Installation of steel sheet pile (SSP)
  - Excavation
  - Construction dewatering
  - Soil management
  - Waste segregation and containment

HAZARD SUMMARY (CONTINUED)

SITE HAZARDS

Hazards present at JFOS include:

Chemical

- PCB concentrations in soil have been observed up to 330 milligrams per kilogram (mg/kg) at the JFOS.

Physical

- Electrical hazards
- Ergonomic hazards
- Flammable liquids
- Hazardous processes
- Heavy equipment/moving machinery
- Mechanical failures
- Noise exposure
- Slips, trips and falls
- Soft/loose soils and steep slopes
- Struck by
- Struck against
- Temperature extremes
- Traffic
- Underground utilities and features
- Unstable ground
- Visibility
- Work near water

The project plans and specifications will require the selected contractor to prepare a HASP for planned construction activities. The following hazard controls, based on the tasks identified in the field activities above, are required for SoundEarth employees responsible for oversight, sample collection, inspection, and measuring tasks during active construction, performed from the Observers' Zone:

- Level D PPE, which includes hard hat, steel-toed boots, safety glasses, hearing protection, task-appropriate gloves, and a reflective safety vest.
- Chemical-resistant boots for work performed inside the limits of the removal action excavation (e.g where the protective layer of crushed rock has been disturbed).

- Tyvek (or equivalent) for work performed outside the Observers' Zone during removal action excavation below the tops of the CMP (Subtitle C conditions).

If the results of real-time air monitoring indicate sustained PID readings above 25 ppm (assuming vinyl chloride is not detected above 1 ppm as confirmed with colorimetric tubes, and PCBs are not detected above 1 ppm by monitoring with the Miniram), then additional engineering control options, such as ventilation and/or covering source areas, will be implemented.

Between phases of active construction, the minimum level of hazard control will consist of:

- Level D Modified Personal Protective Equipment (PPE), which includes work boots, reflective safety vest, task-appropriate gloves, and task-appropriate safety glasses. Hearing protection as needed/applicable.

Level C PPE

If the results of real-time air monitoring indicate that any of the following thresholds have been exceeded in the observer's breathing zone, then work will be temporarily suspended, and the contractor and owner will evaluate additional engineering controls for implementation:

- Airborne PCB concentrations greater than the Washington State Department Labor and Industries Safety & Health (DOSH) time-weighted average (TWA) of 0.5 mg/m^3
- Two consecutive airborne vinyl chloride concentrations greater than the DOSH time-weighted average (TWA) of 1.0 ppm
- Sustained PID readings that exceed the DOSH TWA of 50 ppm in the absence of PCBs and vinyl chloride exceedances.

If the real-time air-monitoring results indicate on-going exceedance of the above-listed thresholds, then the following Level C PPE will be required:

- Full-face air-purifying respirator with a stacked high-efficiency particulate air (HEPA) and organic vapor (OV) cartridge.
- Tyvek (or equivalent) in addition to Level D PPE.

This hazard summary is presented solely for introductory purposes, and the information contained in this section should be used only in conjunction with the full text of this HASP. A complete description of the project, site conditions, investigation methods, and investigation results can be found in previous reports referenced in Section 5.1.1, Reports that Provide Chemical Data.

TABLE OF CONTENTS

FIGURES

ATTACHMENTS

1.0 INTRODUCTION

This Site-Specific Health and Safety Plan (HASP) was written for the use of SoundEarth Strategies, Inc. (SoundEarth) and its employees. The health and safety and emergency response protocols outlined in this plan are designed to ensure compliance with state and federal regulations governing worker safety on hazardous waste sites. The Department of Labor has published final rules (Part 1910.120 of Title 29 of the Code of Federal Regulations, March 6, 1990) that amend the existing Occupational Safety and Health Administration (OSHA) standards for hazardous waste operations and emergency response. Within the State of Washington, these requirements are addressed in Chapter 296-843 of the Washington Administrative Code, Hazardous Waste Operations. These regulations apply to the activities to be performed at this Site as a site remediation, or cleanup, under the Federal Resource Conservation and Recovery Act of 1976 and/or the Washington State Model Toxics Control Act (MTCA).

The project plans and specifications will require contractors and subcontractors to prepare and effectively implement their own HASP based on their unique scope of work and professional expertise. Each contractor's HASP must comply with all applicable federal, state, and local regulations. The contractor's HASP should employ appropriate best practices to protect all personnel working on the Site, as well as the public, and to prevent negative impacts to the JFOS project.

The responsibilities of SoundEarth for safety on this Site are limited to:

- **Implementation** of the provisions of this HASP for the protection of its employees and visitors on the JFOS project to the extent that the project and its hazards are under the control of SoundEarth.
- **Protection of the JFOS project**, other personnel, and the public from damage, injury, or illness as a result of the activities of SoundEarth and its employees while on the Site.
- **Provision** of additional safety-related advice and/or management as contractually determined between the parties.

This plan is active for this Site until 1 year from the date of the HASP or until SoundEarth implements a scope of work change not covered by this HASP, whichever comes first, after which time it must be reviewed and extended. SoundEarth will modify this HASP, if necessary, to address changing field conditions or additional work tasks.

2.0 PROJECT INFORMATION

Project Name: Jorgensen Forge Outfall Site
Project Address: 8531 East Marginal Way South, Seattle, Washington
Owner: Jorgensen Forge Corporation
Occupant/Operator: Jorgensen Forge Corporation
Nature of Activities at this Site: Current: Steel and aluminum forging and machining Past: Steel and aluminum forging and machining
Figure 1 shows the Site location and major features.

3.0 PROJECT RESPONSIBILITIES

SoundEarth personnel shall acknowledge that they have reviewed a copy of the HASP for this project, that they understand it, and that they agree to comply with all of its provisions by signing and dating the Acknowledgement and Agreement form found in Attachment A.

On this project, SoundEarth personnel will provide independent oversight on behalf of JFC. SoundEarth personnel are not responsible for enforcing another employer's safety program but should advise the project manager of any problems with safety compliance so that these may be addressed appropriately with the contractor and owner. In addition, SoundEarth personnel should always feel comfortable to ask anyone else on site to stop work should they observe a condition or activity that presents an immediate and serious hazard to life and/or health and safety.

A daily health and safety tailgate meeting shall take place at the start of every day in the field. SoundEarth personnel attending this meeting are to print and sign their name on the attached Daily Health and Safety Briefing Log, found in Attachment B of this HASP. The log shall list other parties represented at the tailgate meeting, and indicate whether SoundEarth or another party led the meeting.

Project Manager: Deborah Gardner
Site Manager/Health and Safety Officer: Deborah Gardner
Principal in Charge: Ryan K. Bixby
Facility Contact: Wayne Turk

4.0 EMERGENCY INFORMATION

For a critical emergency, 911 should be called. A critical emergency is any emergency that requires a call to 911 and an immediate response by properly trained and equipped emergency services providers. Critical emergencies can include the following:

- A medical injury requiring immediate medical attention beyond basic first aid.
- A fire that cannot be readily extinguished with a hand-held fire extinguisher.
- Any vehicle fire.
- Any explosion, with or without injuries.
- A confined space emergency involving injury or exposure to hazardous atmospheres or requiring a technical rescue.
- A fall protection deployment requiring rescue and/or medical attention.

Note: A SoundEarth employee MAY NOT transport a non-SoundEarth employee off of the Site for medical attention.

Local Emergency Numbers		
Institution/Department	**Name/Address**	**Phone Number**
Hospital	Highline Medical Center 12844 Military Road South Tukwila, Washington	206-244-0180
Alternative Hospital	Swedish First Hill 700 Minor Avenue Seattle, Washington	206-386-2573
USCG Puget Sound Sector		206-217-6001
National Response Center		1-800-424-8802
Local Emergency Response System		206-971-8740
EPA Environmental Response Team		(201) 321-6600
Poison Control		1-800-222-1212

Local Emergency Numbers		
Institution/Department	**Name/Address**	**Phone Number**
Ambulance		911
Police/Sheriff		911
Fire		911

Project Emergency Numbers		
Title	**Name**	**Phone Number**
Project Manager	Deborah Gardner	O: 206-436-5913 C: 206-351-2412
Site Manager/Health and Safety Officer	Deborah Gardner	O: 206-436-5913 C: 206-351-2412
Principal-in-Charge	Ryan K. Bixby	O: 206-436-5923 C: 206-818-0669
Corporate Health and Safety Representative	Chris M. Carter	O: 206-436-5905 C: 206-618-0306
Facility Contact	Wayne Turk	O: 206-762-1100 C: 206-255-8177

Attachment C, Hospital Routes, provides the location and driving directions.

5.0 GENERAL SITE HAZARD ANALYSIS

This section is used to determine the project's potential health and safety hazards specifically as they relate to the Site where the work will occur. Task-related hazards are analyzed in Section 6.0, Task-Related Site Hazard Analysis.

5.1 GENERAL SITE HAZARD ANALYSIS—CHEMICAL

This section describes and identifies potential and known chemical hazards that may be encountered at the Site (summarized in Table 1).

5.1.1 Reports that Provide Chemical Data

- Farallon Consulting, 2008. Final Source Control Evaluation Report, Jorgensen Forge Facility, 8531 East Marginal Way South, Seattle, Washington. May.
- Floyd|Snider. 2011. Source Control Action Completion Report, Jorgensen Forge Outfall Site, Seattle, Washington. May 27.

- Anchor QEA, LLC (Anchor) 2013a. Memorandum, Results of Additional Soil Geoprobe Vertical Characterization at the Jorgensen Forge Outfall Site. From Ryan Barth, Anchor. To Aaron Lambert, U.S. Environmental Protection Agency. January 25.
- Anchor and Farallon Consulting, LLC (Anchor and Farallon). 2012. Phase 2 Investigation Summary Report, Jorgensen Forge Outfall Site, Seattle, Washington. August 8.
- SoundEarth. 2014. *Data Report of Soil Quality Angle Borings Results*, Jorgensen Forge Outfall Site, 8531 East Marginal Way, Seattle, Washington. July 28.

5.1.2 Summary of Potential Chemical Hazards

- PCB concentrations in soil have been observed up to 330 milligrams per kilogram (mg/kg) at the JFOS.

5.1.3 Past Opportunities for Chemical Contamination

The metal-finishing operations on the property and historical forge operations provide the potential for subsurface contamination (Anchor Environmental and Farallon Consulting, 2005).

5.1.4 Opportunities for Unknown or Unidentified Chemical Contamination

The reports listed in Section 5.1.1 above have characterized soil and groundwater conditions at and in the surrounding vicinity of the JFOS facility, including pre- and post-removal action concentration ranges of PCB concentrations at the JFOS project. Soil analytical results from over two dozen borings advanced on 10- to 20-foot centers throughout the JFOS site indicate that:

- PCB concentrations range from non-detect to 330 mg/kg in boring JF-DGP3 at the JFOS site (Anchor 2013; Sound Earth 2014).
- The maximum concentration of total cadmium encountered at the site is 27.1 mg/kg in boring B-DGP1 at a depth of 0 to 2 feet (Anchor and Farallon 2012); this soil layer was removed and disposed in preparation for the 2013 angle boring investigation (SoundEarth 2014).
- The maximum concentration of total lead encountered at the site is 453 mg/kg in boring B-DGP1 at a depth of 0 to 2 feet (Anchor and Farallon 2012); this soil layer was removed and disposed in preparation for the 2013 angle boring investigation (SoundEarth 2014).
- The maximum concentration of petroleum hydrocarbons in soil at the JFOS site are 2,400 mg/kg diesel-range petroleum hydrocarbons (DRPH), 3,900 mg/kg mineral oil and 4,300 mg/kg motor oil in soil at the location of boring T2B4 (Floyd|Snider 2011), at a depth of 18 to 20 feet below ground surface.

Conditions encountered during the execution of the work, or characterization of wastes, and that vary from those described in previous reports, must be reported to the SSO for further investigation and characterization, for potential preparation of an addendum to this HASP.

5.1.5 Existing Controls in Place

The facility is fenced and accessed via staffed security gate, and access to the property and JFOS project. Facility visitors must coordinate access and egress with JFC.

An existing 2-66 steel sheet pile (SSP) containment barrier was installed on Plant 2 in 1995 to prevent the migration of trichloroethylene (TCE) and its breakdown products in groundwater. Since 1995, further remedial actions at Plant 2 have reduced or eliminated concentrations of TCE and its breakdown products in groundwater inside and outside the containment barrier. The planned removal action at the JFOS site will take place outside the 2-66 SSP containment barrier; however, a shallow, temporary excavation of clean backfill material placed inside the existing 2-66 SSP containment barrier in 2012 (following excavation of all vadose-zone soil in the 2-66 SSP enclosure) will be made to reduce lateral loads on the existing 2-66 sheet pile wall. The potential for worker exposure to TCE and its breakdown products, especially vinyl chloride, will be addressed by the following actions:

- Project plans and specifications will limit the temporary off-project excavation (inside the footprint of the 2-66 SSP containment barrier) to the vadose zone above the groundwater table;
- Contractor's installation of the Stage 2 containment barrier, which will isolate the JFOS excavation from Plant 2 groundwater; and,
- Air monitoring using a photo-ionization detector (PID), supplemented with short-term gas detection tubes for vinyl chloride.

5.1.6 Chemical Analytical Results

Identified chemicals are included in Table 1 below.

TABLE 1 CHEMICAL HAZARDS

Chemical (or Class)	DOSH PEL/AL (OSHA PEL if different)	Other Pertinent Limits	Routes of Exposure / Warning Properties	Exposure Symptoms	Target Organs	Recommended PPE / Respiratory Protection	Recommended Monitoring/ Sampling Method
Polychlorinated Biphenyls – Aroclor 1254 (PCBs, Chlorodiphenyl 54% Chlorine)	DOSH PEL: 0.5 mg/m^3 TWA 1.5 mg/m^3 STEL	NIOSH REL: 0.001 mg/m^3 TWA IDLH: 5 mg/m^3 Carcinogen Exposure to fire creates polychlorinated dibenzo-p-dioxins and -furans	Inhalation, ingestion, skin absorption, eye contact Mild hydrocarbon odor	Irritation of eyes, chloracne, liver damage, reproductive effects (potential occupational carcinogen)	Eyes, skin, liver, reproductive system Eye: Irrigate immediately Skin: Soap flush immediately Inhalation: Respiratory support Ingestion: Medical attention immediately	▪ Impermeable, chemical resistant disposable clothing ▪ Nitrile or neoprene gloves If PEL is exceeded: FAPR with stacked HEPA and OV cartridge	If potential for exposure exists: ▪ Monitor for PCBs ▪ Real-Time Monitoring ▪ Miniram or equivalent **If breathing zone measurement exceeds 0.5 mg/m^3 PCBs:** ▪ Temporarily suspend work to evaluate and implement engineering controls ▪ Continue real-time monitoring ▪ Upgrade to FAPR if exceedances continue
1,2-Dichloroethylene	OSHA PEL: 200 ppm TWA	NIOSH REL: 200 mg/m^3 TWA IDLH: 1,000 mg/m^3	Inhalation, ingestion, skin contact Acrid, chloroform-like odor	Irritation of eyes, chloracne, respiratory system, central nervous system	Eyes, skin, respiratory system, central nervous system Eye: Irrigate immediately Skin: Soap flush immediately Inhalation: Respiratory support Ingestion: Medical attention immediately	▪ Impermeable, chemical resistant disposable clothing ▪ Nitrile gloves ▪ Monitor for TCE and Vinyl Chloride	If potential for exposure exists: ▪ Monitor for TCE and Vinyl Chloride

Chemical (or Class)	DOSH PEL/AL (OSHA PEL if different)	Other Pertinent Limits	Routes of Exposure / Warning Properties	Exposure Symptoms	Target Organs	Recommended PPE / Respiratory Protection	Recommended Monitoring/ Sampling Method
DRPH (Petroleum distillates)	DOSH PEL: 100 ppm TWA 150 ppm STEL OSHA PEL: 500 ppm TWA	NIOSH REL: 86 ppm TWA 444 ppm STEL ACGIH TLV: 100 mg/m^3 TWA IDLH: 1,100 ppm FP: -40 to -86°F LEL: 1.1% Carcinogen Combustible liquid	Inhalation, ingestion, skin or eye contact Gasoline or kerosene-like odor Floats on water Clear, yellow-brown liquid	Irritation of eyes, nose, throat; dizziness; drowsiness; headache; nausea; dry cracked skin; inflammation of lungs; dermatitis; skin reddening	Eyes, skin, respiratory system, central nervous system, kidneys Breathing: Respiratory support	▪ Impermeable, chemical-resistant, disposable clothing ▪ Nitrile or neoprene gloves If PEL of 100 ppm is exceeded: APR equipped with OV cartridge	If potential for exposure exists: ▪ Real-Time Monitoring ▪ 10.2 or 10.6 eV PID **Refer to TCE for Response Action**
TCE (Trichloroethylene, trichloroethene, ethylene trichloride)	DOSH PEL: 50 ppm TWA 200 ppm STEL OSHA PEL: 100 ppm TWA 200 ppm C 300 ppm peak (5 minutes)	IDLH: 1,000 ppm LEL: 8% None	Inhalation, skin absorption, ingestion, skin or eye contact Chloroform-like odor	Irritation of eyes and skin; headache; visual disturbance; weakness; exhaustion; dizziness; tremor; drowsiness; nausea; vomiting; tingling, pricking, and inflammation of skin; cardiac arrhythmias; liver injury (potential occupational carcinogen)	Eyes, skin, respiratory system, heart, liver, kidneys, central nervous system Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support **Swallow: Medical attention immediately**	Impermeable, chemical resistant disposable clothing Nitrile gloves If PEL of 50 ppm is exceeded: FAPR with stacked HEPA and OV cartridge	**If potential for exposure exists:** ▪ Real-Time Monitoring ▪ 10.2 or 10.6 eV PID **If breathing zone measurement reaches 50 ppm in the absence of vinyl chloride:** ▪ Temporarily suspend work to evaluate and implement engineering controls ▪ Continue real-time monitoring ▪ Upgrade to FAPR if exceedances continue

Chemical (or Class)	DOSH PEL/AL (OSHA PEL if different)	Other Pertinent Limits	Routes of Exposure / Warning Properties	Exposure Symptoms	Target Organs	Recommended PPE / Respiratory Protection	Recommended Monitoring/ Sampling Method
Vinyl Chloride (Chloroethylene)	DOSH PEL: 1 ppm TWA 5 ppm STEL OSHA PEL: 1 ppm TWA	LEL: 3.6% Carcinogen Attacks iron and steel in the presence of moisture Polymerizes in air and sunlight Flammable gas at standard temperature and pressure	Inhalation, ingestion, skin or eye contact Pleasant odor at high concentrations	Lassitude (weakness, exhaustion); abdominal pain, gastrointestinal bleeding; enlarged liver; pallor or cyanosis of extremities; liquid: frostbite; [potential occupational carcinogen]	Liver, central nervous system, blood, respiratory system, lymphatic system Eyes and skin: If frostbite has occurred, seek medical attention immediately; if tissue is not frozen, immediately flush with water for a minimum of 15 minutes. Breathing: Respiratory support	▪ Impermeable, chemical resistant disposable clothing Silver Shield/composite gloves If PEL of 1 ppm is exceeded: FAPR with stacked HEPA and OV cartridge	**If potential for exposure exists:** ▪ Real-Time Monitoring ▪ Draeger Tubes (or equivalent) ▪ 0.5 to 30 ppm **If breathing zone measurement exceeds 1 ppm vinyl chloride:** ▪ Temporarily suspend work to evaluate and implement engineering controls ▪ Continue real-time monitoring ▪ Upgrade to FAPR if exceedances continue

NOTES:
The NIOSH Pocket Guide provides more information for the chemical in question or for a chemical not listed.
Attachment D, Site-Specific Chemical Material Safety Data Sheets, provides information on each chemical listed above.

µg/m^3 = micrograms per cubic meter
ACGIH = American Conference of Governmental Industrial Hygienists
AL = action limit
AP = air purifying respirator
APF = assigned protection factor
C = ceiling exposure limit
DOSH = Washington State Department of Labor and Industries, Division of Occupational Safety and Health (formerly the Washington Industrial Safety and Health Act)
eV = electron volt
°F = degrees Fahrenheit
FAPR = full-face air-purifying respirator
FP = flash point
HEPA = high efficiency particulate air cartridge
IDLH = immediately dangerous to life and health
IP = ionization potential
LEL = lower explosive limit
mg/m^3 = milligrams per cubic meter
min = minimum
N/A = not applicable
NIOSH = National Institute of Safety and Health
OSHA = Occupational Safety and Health Administration
OV = organic vapor cartridge
PAPR = powered air purifying respirator
PEL = permissible exposure limit
PID = photoionization detector
PPE = personal protective equipment
ppm = parts per million
REL = recommended exposure limit
SA = supplied air respirator
STEL = short-term exposure limit, 15 minutes, unless otherwise noted
TLV = threshold limit value
TWA = time-weighted average

5.2 GENERAL SITE HAZARD ANALYSIS—PHYSICAL

This section addresses known and potential physical hazards specific to the Site.

5.2.1 General Site Specific Physical Hazards

Described below are physical hazards that may be encountered while on the Site.

- Electrical hazards
- Ergonomic hazards
- Flammable liquids
- Hazardous processes
- Heavy Equipment/moving machinery
- Ladders
- Mechanical failures
- Noise Exposure
- Pressurized mechanical systems
- Slips, trips and falls
- Struck by
- Struck against
- Temperature extremes
- Traffic
- Underground utilities and features
- Unstable ground
- Visibility
- Soft/loose soils and steep slopes
- Work near water

5.2.2 Utility Hazards

Described below are utility hazards that may be present at the Site. In order to locate utilities, the Northwest Utility Notification Center should be called at (800) 424-5555, a private locate should be scheduled (as appropriate), side sewer cards should be reviewed, facility records should be reviewed, Engineering, Maintenance, and Safety Department should be consulted, and the Site should be visually inspected.

5.2.2.1 Underground Utilities

The project plan and specifications will require the contractor to schedule public and private utility locates prior to any ground-breaking activities. The following utilities have been decommissioned in connection with completed phases of removal action at JFOS (Floyd|Snider 2011; SoundEarth 2014):

- 24-inch-diameter storm drain, traversing east-west along the north Jorgensen-Boeing Property Line
- 12-inch-diameter storm drain, traversing east-west along the north Jorgensen-Boeing Property Line

5.2.2.2 Overhead Utilities

The following overhead utilities have been identified around the Site:

- Overhead electrical/power lines along the northern property boundary.

5.3 SITE CONTROL PROCEDURES

The JFC facility is fenced and secure, and access to the facility is limited to JFC employees and pre-approved contractors. Contractors and SoundEarth personnel shall coordinate in advance with JFC personnel to access the facility, and identify and maintain appropriate access restrictions in the vicinity of active environmental investigation, sampling, and construction activities.

5.3.1 Hazardous Waste Work Zones

Prior to phases of active construction, the Owners and contractor will establish work zones in a secure area consistent with the contractor's HASP, subject to pre-construction review by EPA. The work zones will be consistent with the following descriptions:

- **Exclusion Zone (EZ).** The EZ will be at least one equipment-width wider than the equipment used for the task, and shall encompass the area of any exposed subsurface media, such as an area where pavement has been removed in order to access the subsurface and complete the task. All personnel entering the EZ must use task-appropriate PPE for that zone, and meet the appropriate training and medical clearance. The boundary of the EZ shall be identified with fencing or caution/warning tape. At the contractor's discretion, a separate EZ may be established for heavy equipment, in accordance with the contractor's HASP. No food, drink, or tobacco use is permitted in the EZ.
- **Contaminant-Reduction Zone (CRZ).** The CRZ, also known as the "warm zone," is a transitional zone between the EZ and the SZ (also known as the "cold zone" or "clean zone"). During active phases of excavation and material decontamination, the CRZ will be equipped with a hand-washing station and boot-washing station. The CRZ provides a location for removal and decontamination of PPE and tools leaving the EZ. No food, drink, or tobacco use is permitted in the CRZ.
- **Support Zone (SZ).** This uncontaminated zone will be the area outside the EZ and CRZ and within the geographic perimeters of the JFOS project and support areas. The SZ is used for support personnel; staging materials; parking vehicles; office, laboratory, and sanitation facilities; and receiving deliveries. Personnel entering this zone include delivery personnel, visitors, security guards, and others who will not necessarily be permitted in the EZ or CRZ.
- **Observers' Zone (OZ).** The OZ may be established for personnel who need to observe and document the contractor's performance of the work. The OZ may be located inside the SZ, in coordination with the contractor's HASP.

Only those personnel that have submitted current 40-hour Hazardous Waste Operation and Emergency HAZWOPER certification will be authorized into EZ, CRZ or OZ.

5.3.2 Decontamination Procedures and Practices

Whenever sampling equipment and/or PPE have the potential to come into contact with contaminated soil, equipment will be decontaminated and PPE will be contained for proper disposal, or decontaminated as appropriate. Decontamination standards and protocols are described in the Appendix D of the CMP Work Plan.

6.0 TASK-RELATED SITE HAZARD ANALYSIS

This section outlines the health and safety hazards that may be present on the Site as a result of the tasks to be performed by SoundEarth or subcontractors as they relate to the chemical and physical hazards identified in Sections 5.1 and 5.2, above. A summary of the controls specific to the Site is presented in Section 7.0, Task-Related Site Hazard Controls Summary.

TASK	HAZARD	PREVENTION
General	Emergency response	Call 911; coordinate response with JFC and the contractor; secure the scene; identify, evaluate, and communicate potential hazards to response personnel
	Visibility	Establish eye contact and use hand signals; avoid blind spots
	Temperature Extremes - Heat	Drink plenty of water, use sunscreen on exposed skin, work in shade if practical; remove PPE during breaks; buddy system; note symptoms of confusion, heat rash, fainting, cramps, presence absence of sweat; temporarily suspend work and rest for symptoms and evaluate whether additional response is warranted
	Temperature Extremes - Cold	Dress for forecast; keep gear dry or replace wet gear; buddy system; note symptoms of shivering, confusion, pain or numbness, irritability, temporarily suspend work and relocate worker to warm vehicle or heated building; evaluate whether additional response is warranted

TASK	HAZARD	PREVENTION
Construction Observation	Heavy Equipment	Coordinate observation position with operator; maintain distance from hydraulics if practical
	Overhead hazards	Overhead crane, hammer, SSP, and auger tooling; drips and splash hazard from overhead equipment, hydraulic lines, excavator bucket
	Unstable Ground	Watch for trip hazards, soft footing, altered ground, stakes, changing traffic patterns (foot traffic and construction traffic
	Fall Protection	Establish an observation position more than 10 feet from SSP; review contractor's fall protection measures during tailgate meetings during excavation and backfill phases
	Work Near Water	Establish an observation position more than 10 feet from open water(including excavation in the wet); stay alert for splashing hazards; if railing is not in place, don a flotation vest for work within 10 feet of the SSP
	Hot Work	Hot work awareness, avoid eye contact with welding and cutting activities
	Noise	Use hearing protection while equipment is operating
Sample Collection	Heavy Equipment	Coordinate collection and delivery positions with operator
	Excavations	For trenches deeper than 4 feet, review temporary shoring stability, access, and egress with contractor; verify DOSH-compliant slope or secure ladder for access/egress; work and foot traffic within 4 feet of any unshored sidewall deeper than 4 feet is prohibited; confined space entrance prohibited
	Unstable Ground	Watch for trip hazards, soft footing, altered ground, stakes, changing traffic patterns (foot traffic and construction traffic)
Measurement, Layout, Mapping, Air Monitoring	Heavy Equipment	Communicate and coordinate pathway with other workers and equipment, if present
	Unstable Ground	Watch for trip hazards, soft footing, altered ground, stakes, changing traffic patterns (foot traffic and construction traffic)

7.0 TASK-RELATED SITE HAZARD CONTROLS SUMMARY

The following hazard controls, based on the tasks identified in the field activities above, are required for SoundEarth employees responsible for oversight, sample collection, inspection, and measuring tasks during active construction:

- Level D PPE for construction-phase activities, which includes hard hat, steel-toed boots, safety glasses, hearing protection, task-appropriate gloves, and a reflective safety vest.
- Chemical-resistant boots for work performed inside the limits of the removal action excavation (e.g where the protective layer of crushed rock has been disturbed).
- Tyvek (or equivalent) for work performed outside the Observers' Zone during removal action excavation below the tops of the CMP (Subtitle C conditions).

If the results of real-time air monitoring indicate sustained PID readings above 25 ppm (assuming vinyl chloride is not detected above 1 ppm as confirmed with colorimetric tubes, and PCBs are not detected above 1 ppm by monitoring with the Miniram), then additional engineering control options, such as ventilation and/or covering source areas, will be implemented.

Between phases of active construction, the minimum level of hazard control will consist of:

- Level D Modified Personal Protective Equipment (PPE), which includes work boots, reflective safety vest, task-appropriate gloves, and task-appropriate safety glasses. Hearing protection as needed/applicable.

Level C PPE

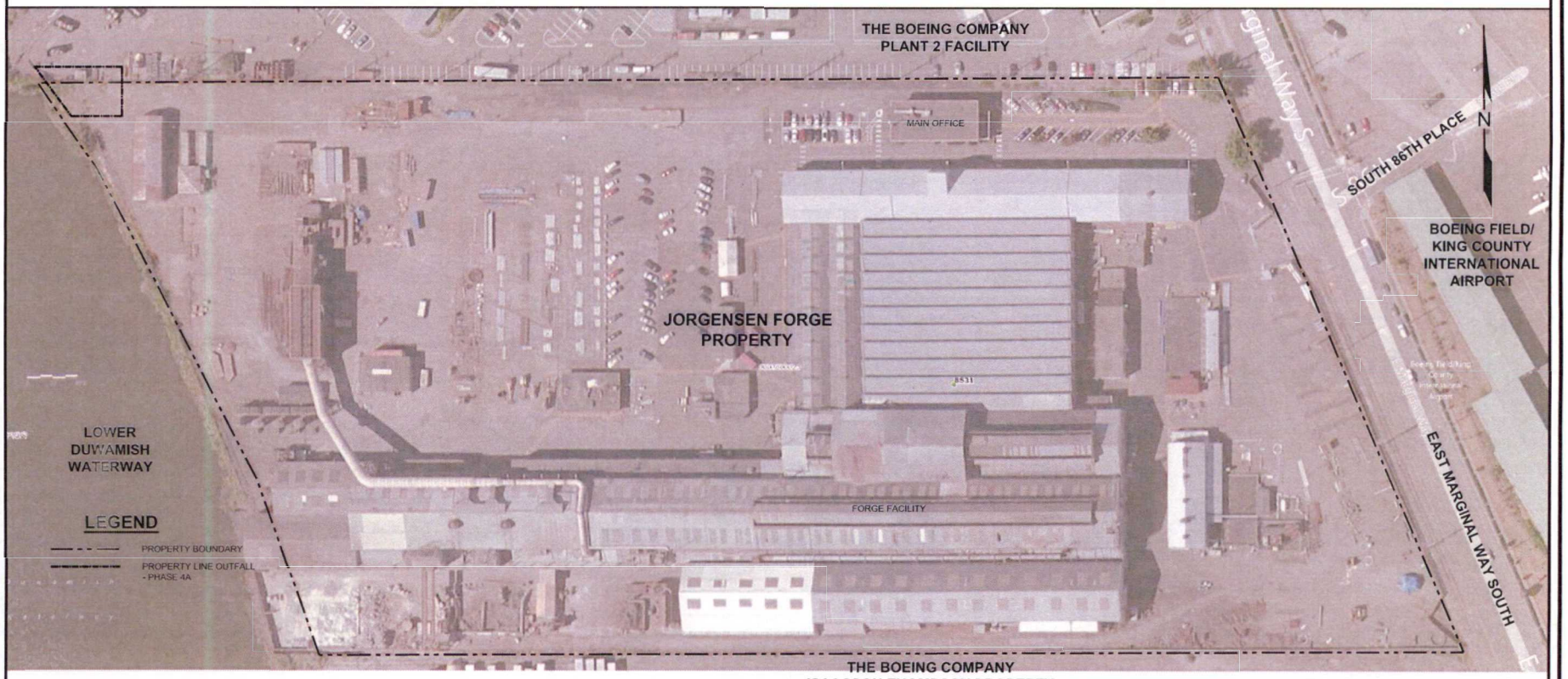
If the results of real-time air monitoring indicate that any of the following thresholds have been exceeded in the observer's breathing zone, then work will be temporarily suspended, and the contractor and owner will evaluate additional engineering controls for implementation:

- Airborne PCB concentrations greater than the Washington State Department Labor and Industries Safety & Health (DOSH) time-weighted average (TWA) of 0.5 mg/m^3
- Two consecutive airborne vinyl chloride concentrations greater than the DOSH time-weighted average (TWA) of 1.0 ppm
- Sustained PID readings that exceed the DOSH TWA of 50 ppm in the absence of PCBs and vinyl chloride exceedances.

If the real-time air-monitoring results indicate on-going exceedance of the above-listed thresholds, then the following Level C PPE will be required:

- Full-face air-purifying respirator with a stacked high-efficiency particulate air (HEPA) and organic vapor (OV) cartridge.
- Tyvek (or equivalent) in addition to Level D PPE.

FIGURE



SoundEarth Strategies
WWW.SOUNDEARTHINC.COM

DATE: 09/05/13
DRAWN BY: JQC
CHECKED BY: DHG
CAD FILE: 0995-001-03_2013HASP_F1

PROJECT NAME: JORGENSEN FORGE OUTFALL SITE
CERCLA DOCKET NUMBER: 10-2011-0017
STREET ADDRESS: 8531 EAST MARGINAL WAY SOUTH
CITY, STATE: SEATTLE, WASHINGTON

REGION:

0 30 60 120 240
APPROXIMATE SCALE IN FEET

FIGURE 1
PROPERTY FEATURES MAP

P:\0995 JORGENSEN FORGE CORPORATION\TECHNICAL\CAD\HASP\0995-001-03_2013HASP_F1.DWG 9/5/2013

ATTACHMENT A

ACKNOWLEDGEMENT AND AGREEMENT FORM

SoundEarth Strategies

ACKNOWLEDGEMENT AND AGREEMENT FORM

I acknowledge that I have reviewed a copy of the Health and Safety Plan for this project, that I understand it, and that I agree to comply with all of its provisions. I also understand that I could be prohibited by the Site Manager/Health and Safety Officer or other SoundEarth personnel from working on this project if I fail to comply with any aspect of this Health and Safety Plan:

Name	Signature	Company	Date
Name	Signature	Company	Date
Name	Signature	Company	Date
Name	Signature	Company	Date
Name	Signature	Company	Date
Name	Signature	Company	Date
Name	Signature	Company	Date
Name	Signature	Company	Date
Name	Signature	Company	Date
Name	Signature	Company	Date
Name	Signature	Company	Date
Name	Signature	Company	Date

ATTACHMENT B

DAILY HEALTH AND SAFETY BRIEFING LOG

SoundEarth Strategies

DAILY HEALTH AND SAFETY BRIEFING LOG

Date: _____ **Start Time:** _____

Sites Discussed: _____

_____

_____

_____

Subjects Discussed: _____

_____

_____

_____

_____

ATTENDEES

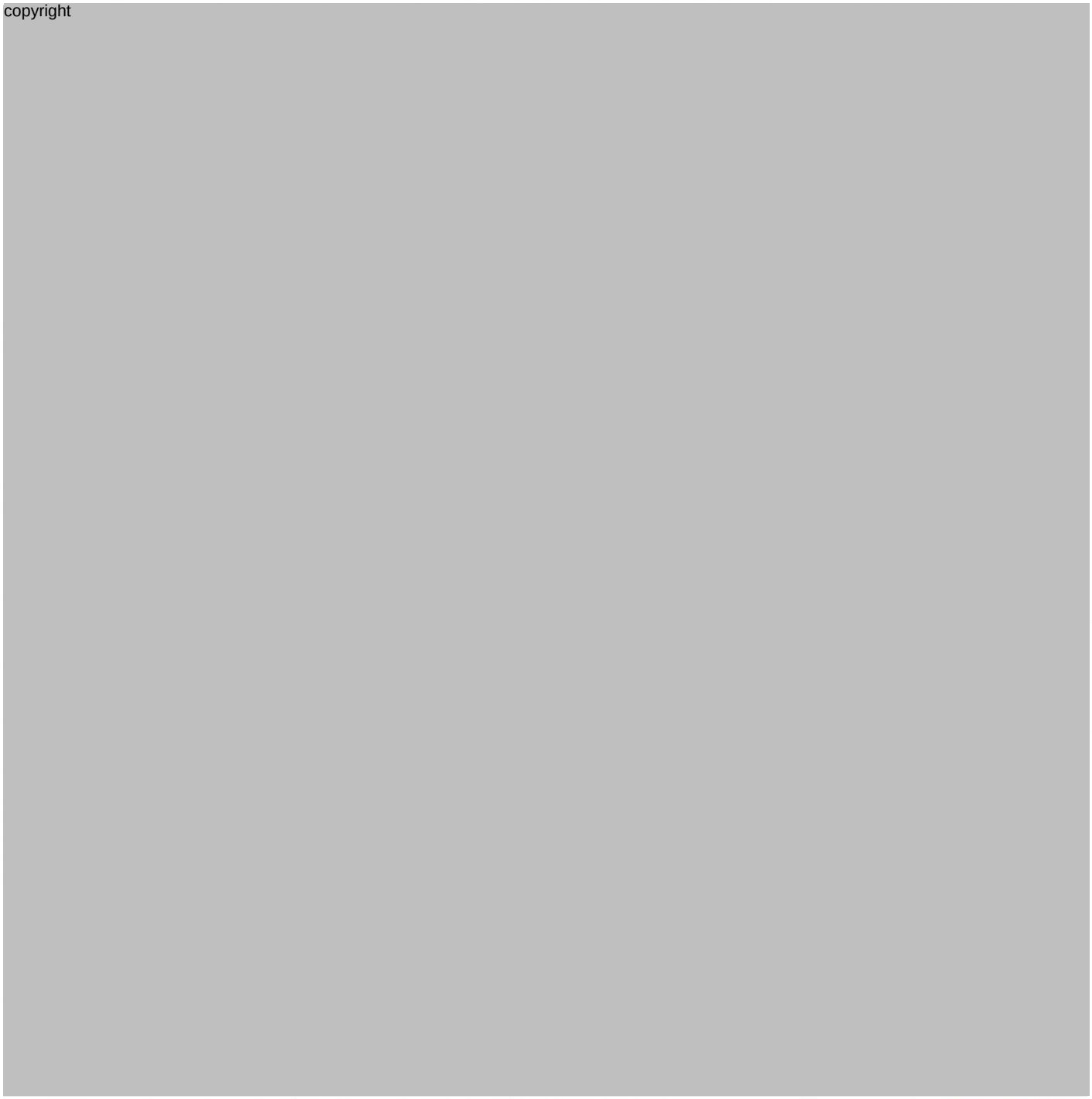
Print Name	Signature
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Meeting Conducted by _____ **Date Signed** _____

ATTACHMENT C
HOSPITAL ROUTES

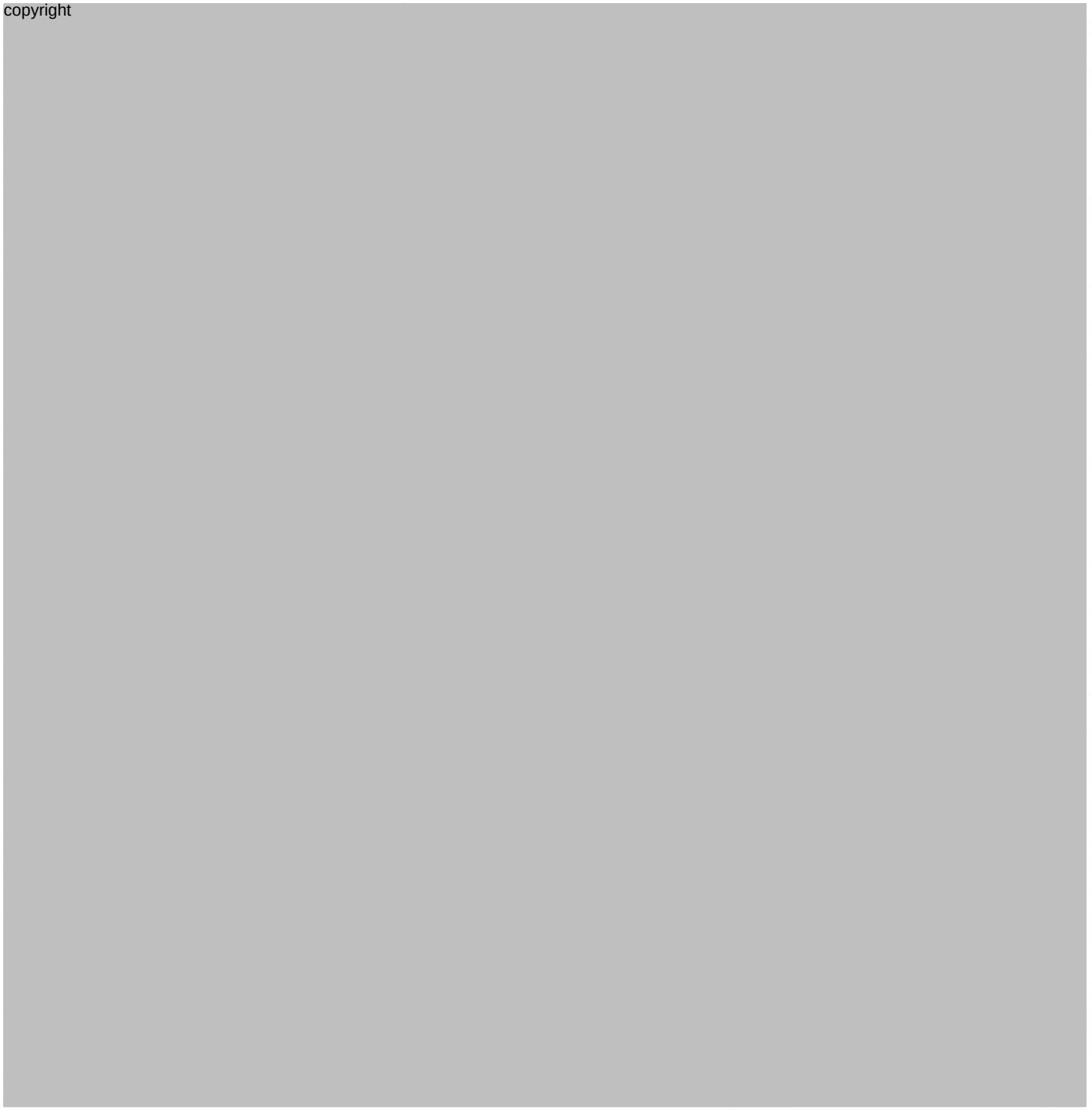
Google

Directions to Highline Medical Center/Specialty Campus
12844 Military Rd S, Tukwila, WA 98168
3.7 mi – about **8 mins**

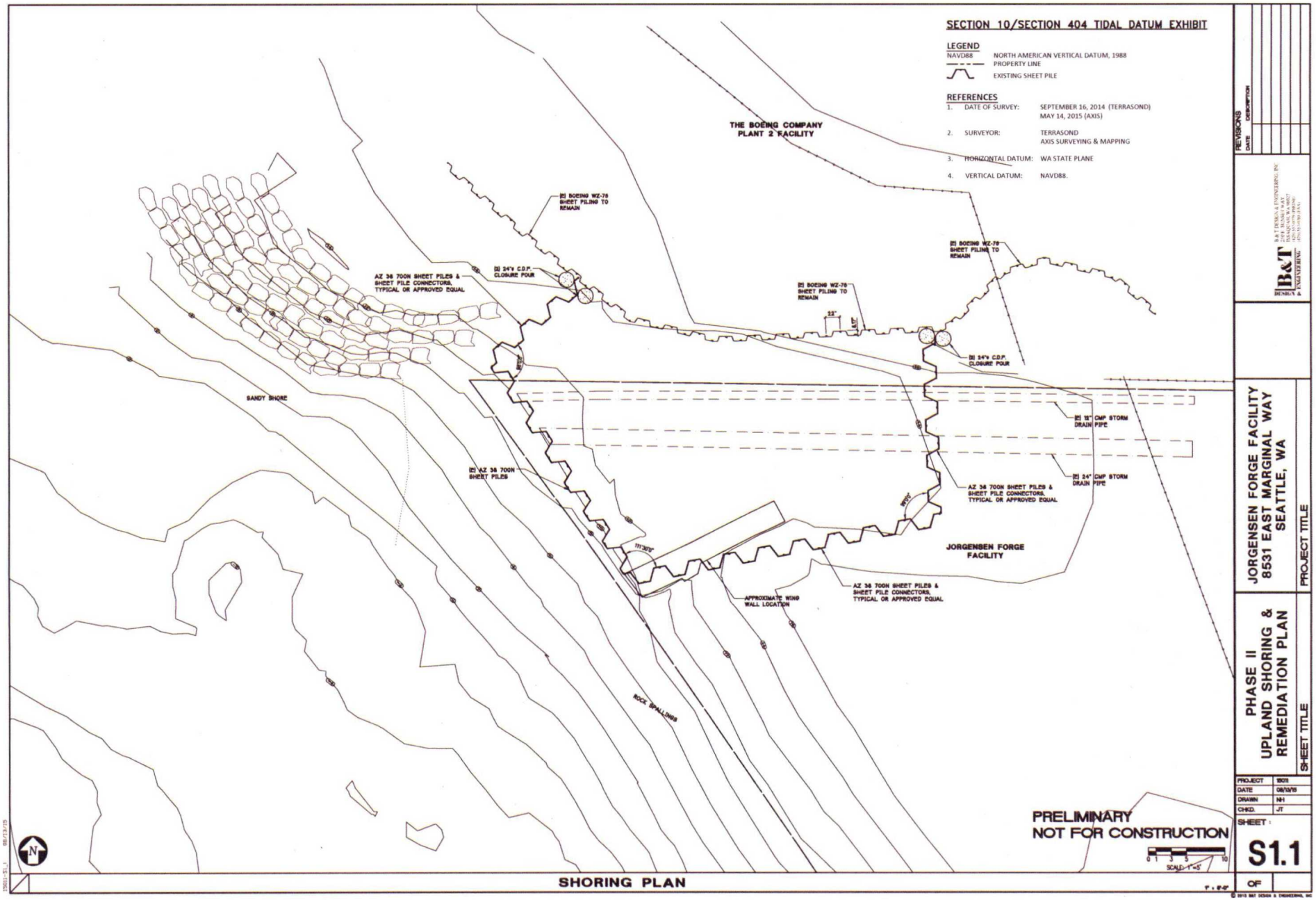


Google

Directions to Swedish First Hill Emergency Room
700 Minor Ave, Seattle, WA 98104
6.7 mi – about **12 mins**



APPENDIX B
PRELIMINARY DESIGN


SECTION 10/SECTION 404 TIDAL DATUM EXHIBIT
LEGEND
NAVD88 NORTH AMERICAN VERTICAL DATUM, 1988
PROPERTY LINE
EXISTING SHEET PILE
REFERENCES
1. DATE OF SURVEY: SEPTEMBER 16, 2014 (TERRASOND) MAY 14, 2015 (AXIS)
2. SURVEYOR: TERRASOND AXIS SURVEYING & MAPPING
3. HORIZONTAL DATUM: WA STATE PLANE
4. VERTICAL DATUM: NAVD88.
THE BOEING COMPANY PLANT 2 FACILITY
[E] BOEING WZ-76 SHEET PILING TO REMAIN
AZ 36 700N SHEET PILES & SHEET PILE CONNECTORS, TYPICAL OR APPROVED EQUAL
[E] 24"ø C.D.F. CLOSURE POUR
SANDY SHORE
[E] AZ 36 700N SHEET PILES
[E] 18" CMP STORM DRAIN PIPE
[E] 24" CMP STORM DRAIN PIPE
JORGENSEN FORGE FACILITY
APPROXIMATE WING WALL LOCATION
ROCK SPALLINGS
PRELIMINARY
NOT FOR CONSTRUCTION
SCALE: 1"=5'
SHORING PLAN
REVISIONS
DATE
DESCRIPTION
B&T DESIGN & ENGINEERING, INC.
DESIGN & ENGINEERING
JORGENSEN FORGE FACILITY
8531 EAST MARGINAL WAY
SEATTLE, WA
PROJECT TITLE
PHASE II
UPLAND SHORING & REMEDIATION PLAN
SHEET TITLE
PROJECT 1501
DATE 08/13/15
DRAWN NH
CHKD. JT
SHEET
S1.1
OF

APPENDIX C

PLANT 2 COORDINATION UNDER RCRA ORDER

INTRODUCTION

This Sampling and Analysis Plan (SAP) was prepared in support of the planned removal action at the Jorgensen Forge Outfall Site (JFOS), and it is supplemental to the Boeing Plant 2 RCRA Order. This SAP was prepared as an attachment to the Corrugated Metal Pipe (CMP) Work Plan for EPA's joint review under the respective JFOS CERCLA and Plant 2 RCRA Orders.

Specifically, this SAP applies to the planned excavation of soil inside and adjacent to the south wall of the existing 2-66 sheetpile enclosure on Plant 2. The objective of this excavation is to enable safe removal of soil to target design depths at the JFOS project on the opposite side of the wall. Although the work described in this SAP is part of the JFOS scope of work proceeding under CERCLA Order, this action is located on and accessed from Boeing Plant 2, and subject to procedures and methods established under the Plant 2 RCRA Order.

EXCAVATION

Engineering design of the shored excavation includes the temporary removal of vadose-zone soil next to the inside south wall of the existing 2-66 sheetpile wall to relieve unbalanced loads on the 2-66 wall during the JFOS shored excavation. The objective of this excavation is to enable safe removal of soil inside the shored JFOS excavation to Elevation -16 feet (relative to North American Vertical Datum 1988), without deflecting of the 2-66 sheetpile wall. The 2-66 sheetpile excavation will extend to groundwater, which is approximately 10 feet below the top of the existing 2-66 sheetpile wall to Elevation +6 feet, and extend from the base of the wall for a horizontal distance of at least 4 feet away from the wall. The south side of the 2-66 sheetpile excavation will be shored by the southern 2-66 sheetpile wall. The unshored sidewalls within the 2-66 sheetpile wall will either be sloped or maintained with temporary shoring methods.

BACKFILL

The backfill to be removed from inside the 2-66 sheetpile wall was placed as clean sandy-gravel backfill following a much larger RCRA Order Interim Measure action in 2012. The 2012 remedial excavation removed contaminated vadose-zone soil from inside the 2-66 sheetpile wall. After emplacement of the clean backfill, tidal and seasonal fluctuations in groundwater levels, though dampened within the sheetpile enclosure, may have caused groundwater that is assumed to be tainted by chlorinated VOCs to come into contact with clean backfill near the water table interface. The excavated backfill will be stockpiled on Plant 2 and sampled to determine suitability for reuse prior to being returned to backfill the excavation inside the 2-66 sheetpile wall.

SAMPLING AND ANALYSIS

Samples of stockpiled backfill will be discrete grab samples that will be collected with new, single-use, decontaminated hand tools from approximately 6 to 12 inches beneath the surface of the stockpile. The location of each of the samples will be based on field screening results using a photoionization detector to indicate whether volatile contamination might be present. If field screening does not indicate contamination, the stockpile will be divided into sections of relatively equal volume and a discrete sample will be collected from each section to attain the number of samples appropriate for the stockpile volume.

The number of samples that will be collected from the backfill stockpile will be in accordance with Washington State Department of Ecology (Ecology) *Guidance for Remediation of Petroleum Contaminated Sites* (Ecology 2011). The estimated volume of stockpiled backfill is approximately 150 cubic yards, therefore, five samples of stockpiled backfill will be collected, consistent with the requirement in Table 6.9 of Ecology's guidance document for characterization of stockpiles with volumes between 101 and 500 cubic yards.

Stockpile samples will be collected in accordance with EPA Method 5035A, Closed-System Purge-and-Trap and Extraction for Volatile Organics in Soil and Waste Samples, and will be immediately placed into new, pre-cleaned, laboratory-supplied sample containers and placed in a cooler with sufficient bagged ice (or equivalent) to maintain an internal temperature of 4 degrees Celsius or lower inside the cooler. The samples will be transported to the analytical laboratory and will be submitted under chain-of-custody protocols for chlorinated volatile organic compound analysis by EPA Method 8260C.

Other aspects of the work described above will be performed in accordance with established procedures and methods under the Plant 2 RCRA Order.

APPENDIX D
DECONTAMINATION PROCEDURES

SoundEarth Strategies, Inc.
2811 Fairview Avenue East, Suite 2000
Seattle, Washington 98102

JORGENSEN FORGE OUTFALL SITE
FINAL SSP DECONTAMINATION WORK PLAN, STANDARDS AND OBJECTIVES

IN PARTIAL FULFILMENT OF THE THIRD MODIFICATION FOR THE ADMINISTRATIVE ORDER ON CONSENT FOR REMOVAL ACTION, CERCLA DOCKET NO. 10-2011-0017

Property:
Jorgensen Forge Property
Jorgensen Forge Outfall Site
8531 East Marginal Way South
Seattle, Washington

Prepared for:
U.S. Environmental Protection Agency
Region 10
1200 Sixth Avenue
Seattle, Washington

Report Date:
September 2, 2015

September 2, 2015

Mr. Ravi Sanga
United States Environmental Protection Agency
Region 10
1200 Sixth Avenue, Suite 900
Seattle, WA 98101-3140

SUBJECT: FINAL SSP DECONTAMINATION WORK PLAN, STANDARDS AND OBJECTIVES
JORGENSEN FORGE OUTFALL SITE
SEATTLE, WASHINGTON
CERCLA DOCKET NO. 10-2011-0017

Dear Mr. Sanga,

On behalf of Jorgensen Forge Corporation (JFC) and The Boeing Company (Boeing), SoundEarth Strategies, Inc. (SoundEarth) has prepared this submittal as an appendix to the Corrugated Metal Pipe (CMP) Work Plan for implementation at the Jorgensen Forge Outfall Site in Seattle, Washington (JFOS; Figures 1 and 2). The CMP Work Plan is a pending submittal required under the *Third Modification to the Administrative Order on Consent for Removal Action* (Order) *at the Jorgensen Forge Outfall Site* (Third Modification; EPA 2015), Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Docket No. 10-2011-0017, dated June 30, 2015. The SSP Decontamination Work Plan is being submitted in advance of the CMP Work Plan so as to enable timely SSP decontamination during a period of favorable weather. The SSP Decontamination Work Plan would otherwise be reviewed and approved when submitted as an appendix to the CMP Work Plan, which is due as a draft to EPA by August 17, 2015.

U.S. Environmental Protection Agency (EPA) review and comment on decontamination standards and objectives proposed for implementation at the Jorgensen Forge Outfall Site in Seattle, Washington (JFOS; Figures 1 and 2). Phased removal actions at JFOS have been proceeding under the Order since 2010 (EPA 2010) and is supplemental to the following:

- JFC. 2015. *Supplemental Removal Action Cleanup Report, Jorgensen Forge Outfall Site, Seattle, Washington, CERCLA Docket No. 10-2011-0017*. October 3, 2014. Revised January 15.

- SoundEarth. 2014. *Memorandum: Sampling and Analysis Procedures for Sheetpile Residue, Jorgensen Forge Outfall Site, Seattle, Washington, CERCLA Docket No. 10-2011-0017*. August 7.

BACKGROUND

In September 2014, steel sheet pile (SSP) panels were extracted from the Duwamish Waterway and temporarily staged at JFOS for future re-use (JFC 2015). The original purpose of the SSP panels had been to form a cofferdam structure to maintain bank stability during implementation of the Jorgensen Forge Early Action Area (JFEAA) in-water removal action by Earle M. Jorgensen (EMJ) under CERCLA Docket No. 10-2013-0032. The SSP panels formed a cofferdam that allowed the targeted, in-water removal of polychlorinated biphenyl (PCB)-contaminated bank materials. The SSP panels that comprised the three

in-water sides of the cofferdam were extracted, and the SSP panels that comprised the fourth side on the adjoining upland remain in place.

Currently, the extracted 60-foot-long SSP panels are staged in two, 3-foot wide stacks, on dunnage, secured on and under plastic sheeting to prevent contact with the ground surface (see Photograph 1). Prior to decontamination in August 2015, the stacks also were surrounded by wattles to control precipitation runoff. Two types of PCB-containing residues on the SSP panels have been confirmed: 1) a silty-sandy bank or backfill material that variably adhered to the former bottom ends of the panels (see Photograph 2), and 2) a black stain variably present approximately 2 to 5 feet below the former top ends (JFC 2015) on the interior side of the cofferdam sheets only (see Photograph 3). This submittal presents the standards and objectives for compliant decontamination of the SSP panels prior to reuse.

Photograph 1: Temporary staging and protection of materials and the ground surface, viewing east-southeast.

Photograph 2: Gray, sandy residue at former bottom ends (both sides).

Photograph 3: Black stain below former top ends (former interior side only).

DECONTAMINATION STANDARDS AND OBJECTIVES

JFC and Boeing understand that the SSP panels must be decontaminated consistent with 40 CFR 761.79 (Decontamination standards and procedures for PCBs) as a prerequisite for re-use. A secure, designated work zone will be established on the JFC Property for decontamination activities. Different decontamination standards will apply to the conditions anticipated during implementation:

- Non-disposable equipment and structures must be decontaminated using mechanical means or pressure washing to achieve a "clean debris surface" as defined in 40 C.F.R. §268.45, Table 1, footnote 3 and 40 C.F.R. §761.79 (h)(1). The facility already has demonstrated that the proposed method is capable of decontaminating the material to the applicable level set out in 40 C.F.R. §761.79 (b)(1) through (b)(4). JFC and Boeing will further ensure that any decontamination conducted pursuant to EPA's approval will be conducted in compliance with the requirements of 40 C.F.R. §761.79 (e) – (g).
- The standard defined in §761.79(c)(2)(i) for moveable equipment (swabbing with solvent) will apply to the black stain areas near the former top inside ends of the SSP panels.
- All reusable equipment will be decontaminated in accordance with the above-listed standards and objectives.
- All decontamination process wastes will be disposed pursuant to 40 CFR §761.79 (g).

MANAGEMENT OF DECONTAMINATION ACTIVITIES

JFC and Boeing will actively manage JFOS material decontamination activities including specification of controls and procedures that minimize wastes, and containment and appropriate disposal of wastes generated during decontamination processes. JFC's and Boeing's required procedures for decontamination are included in Attachment A.

Sincerely,

Miles Dyer
Jorgensen Forge Corporation

William D. Ernst
The Boeing Company

Attachments:
Figure 1 Physiographic Setting
Figure 2 Property Features Map
Attachment A Required Procedures for Decontamination

cc: Mr. Dave Bartus, EPA
Ms. Melissa Blankenship, EPA
Ms. Robbie Hedeen, EPA
Ms. Rebecca Chu, EPA
Mr. Shawn Blocker, EPA
Ms. Romy Freier-Coppinger, Washington Department of Ecology
Mr. Tom Colligan, Floyd|Snider
Mr. Dan Balbiani, P.E., PES Environmental , Inc.
Ms. Deborah Gardner, SoundEarth Strategies, Inc.

DHG:

ATTACHMENT A

REQUIRED PROCEDURES FOR DECONTAMINATION

ATTACHMENT A – REQUIRED PROCEDURES FOR DECONTAMINATION

JFC and Boeing are requiring the following procedures for decontamination of materials used in connection with Jorgensen Forge Outfall Site (JFOS) removal actions under CERCLA Docket No. 10-2011-0017. The required procedures include waste minimization and containment objectives, and documentation of compliance with 40 CFR 761.79 (Decontamination standards and procedures for PCBs). The procedures to be followed are for the following decontamination activities:

- Decontamination Standards
- Transportation and Staging of SSP Panels
- Designated Decontamination Work Zone
- Waste Minimization
- Waste Management and Disposal

Decontamination Standards

- Non-disposable equipment and structures must be decontaminated using mechanical means or pressure washing to achieve a "clean debris surface" as defined in 40 C.F.R. §268.45, Table 1, footnote 3 and 40 C.F.R. §761.79 (h)(1). The facility already has demonstrated that the proposed method is capable of decontaminating the material to the applicable level set out in 40 C.F.R. §761.79 (b)(1) through (b)(4). JFC and Boeing will further ensure that any decontamination conducted pursuant to EPA's approval will be conducted in compliance with the requirements of 40 C.F.R. §761.79 (e) – (g).
- The standard defined in §761.79(c)(2)(i) for moveable equipment (swabbing with solvent) will apply to the black stain areas near the former top ends of the SSP panels. Prior to treating the black stain, the surface temperature of each SSP panel will be measured using an infrared thermometer to confirm that the materials are within the range of 40°F and 100°F, for maximum extraction efficiency.
- All reusable equipment will be decontaminated in accordance with the above-listed standards and objectives.
- All decontamination process wastes will be disposed pursuant to 40 CFR §761.79 (g).

Transportation and Staging of SSP Panels

SSP panels will be relocated from the existing staging area inside the JFOS work area to the proposed staging area inside the designated Decontamination Work Zone.

- The ground surface of the transportation route will be covered with plastic sheeting to intercept any residues that may become dislodged during rigging and transport.
- The SSP panels will be transported to the Decontamination Work Zone above the protected transportation route, without contacting the ground surface or protective plastic sheeting.
- The SSP panels will be stacked on dunnage on and under plastic sheeting. Transport will be scheduled on a fair-weather day so that precipitation does not require collection or management.
- The Decontamination Work Zone will be formally secured with temporary fencing and signage to communicate work zone access and egress conditions.

Designated Decontamination Work Zone

A Decontamination Work Zone will be designated on JFC's Property inside the paved staging area within 200 feet of the current location of the SSP panels. The Decontamination Work Zone will encompass a decontamination cell, a Contamination Reduction Zone (CRZ), and two separate SSP panel staging areas for before and after decontamination.

- The Decontamination Work Zone and paved portions of the access route from the temporary staging area shall be street-swept prior to designating and securing the work zone, and the approximate corners of the work zone will be marked with utility locating paint on pavement prior to transporting the SSP panels.
- A decontamination cell shall be constructed inside the Decontamination Work Zone atop pavement located, to collect decontamination fluids as well as precipitation that falls during decontamination activities.
- The decontamination cell shall consist of a bermed perimeter lined with two sheets of heavy-duty geomembrane with a minimum thickness of at least 20 mils, separated by a 6-inch thick layer of sand. The berm shall be constructed using Ecology blocks, or equivalent weighted barriers, placed in a manner that anchors the liner. The decontamination cell shall be longer and wider than one SSP panel (minimum 20 feet wide, 65 feet long, with a minimum 1-foot berm).
- A storage tank with capacity of at least 5,000 gallons (or the equivalent of up to six inches of liquid inside the minimum cell area, whichever is greater) will be maintained for storage of decontamination fluids and any incidental precipitation that lands inside the decontamination cell. Fluids will be transferred from the cell to the storage tank for profiling and disposal, using a trash pump, so that fluid levels inside the decontamination cell do not exceed 6 inches deep.
- A CRZ will be established next to the decontamination cell. Workers will access and egress the decontamination cell through the CRZ, where they will be able to decontaminate and/or remove personal protective equipment (PPE) and other equipment.
- Solid and liquid wastes will be segregated and separately contained to the extent practicable:
  - Solid wastes anticipated from the planned scope of decontamination activities include: solid residue vacuumed from the former bottom ends of the SSP panels; dunnage; PPE; slings, rigging, and guide ropes that contact the SSP panels; plastic sheeting; wire brushes and scraping tools.
  - Liquid wastes anticipated from the planned scope of decontamination activities include: excess CAPSUR ® solvent used to treat the interlock channels, decontamination water used inside the CRZ, and incidental precipitation that lands inside the decontamination cell.
- Separate staging areas will be established for stacking and protecting the SSP panels before and after decontamination. The staging area will be identical to the existing staging area, with SSP panels stacked on dunnage, on and under plastic sheeting, and wattles to control precipitation runoff.

Waste Minimization

In an effort to minimize waste volumes, decontamination of the SSP panels will proceed according to the following sequence:

1. Dunnage will be placed at intervals that do not come into contact with the black stain near the former top ends of the SSP panels and the sandy residue on the former bottom ends of the SPP panels.
2. Dunnage will be visually inspected and brushed as necessary whenever the SSP panels are flipped to ensure that any dislodged particles do not come into contact with a decontaminated side of an SSP panel.
3. The sandy residue will be scraped and vacuumed from the former bottom ends of the SSP (both sides).
4. The black stain near the former, top inside ends of the SSP will be swabbed using CAPSUR® solvent.
5. Excess solvent will be allowed to flow through the interlock channel down to the former bottom ends, where it will be collected and contained for disposal.
6. In the event that creosote is present after treating with CAPSUR®, an alternative solvent product will be applied to remove the creosote residue.
7. Any sandy residue remaining after the first step will be scraped and vacuumed a second time.
8. As a last resort, targeted air pressure applied to the interlock channel may be used to remove sandy residue from the former bottom ends of the channel. If air pressure becomes necessary, a portable framed enclosure finished with plastic sheeting will be constructed around the former bottom ends of the SSP panels to intercept and contain any residual particles released from the channels. Dislodged particles will be vacuumed from around and under the targeted area. The enclosure will be portable so that it does not interfere with safe rigging, flipping, or transport of the SSP panels.

Waste Management and Disposal

JFC and Boeing will manage and coordinate the segregation, containment, profiling, and disposal of solid and liquid wastes in accordance with applicable regulations.

APPENDIX E
SAMPLING AND ANALYSIS PLAN AND QUALITY ASSURANCE PROJECT PLAN

SoundEarth Strategies, Inc.
2811 Fairview Avenue East, Suite 2000
Seattle, Washington 98102

JORGENSEN FORGE OUTFALL SITE

SAMPLING AND ANALYSIS PLAN/QUALITY ASSURANCE PROJECT PLAN

THIRD MODIFICATION FOR THE ADMINISTRATIVE ORDER ON CONSENT FOR REMOVAL ACTION, CERCLA DOCKET NO. 10-2011-0017

Property:
Jorgensen Forge Property
Jorgensen Forge Outfall Site
8531 East Marginal Way South
Seattle, Washington

Prepared for:
U.S. Environmental Protection Agency
Region 10
1200 Sixth Avenue
Seattle, Washington

Date: January 21, 2016

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ACRONYMS AND ABBREVIATIONS

ARI	Analytical Resources, Inc.
ASTM	American Society of Testing and Materials
Boeing	The Boeing Company
CMP	corrugated metal pipe
COCs	constituents of concern
DQO	data quality objective
Ecology	Washington State Department of Ecology
EDD	electronic data deliverable
EPA	U.S. Environmental Protection Agency
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
JFC	Jorgensen Forge Corporation
JFOS	Jorgensen Forge Outfall Site
LCS	laboratory control sample
MS	matrix spike
MSD	matrix spike duplicate
PCBs	polychlorinated biphenyls
ppm	part per million
PQLs	Practical Quantitation Limits
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RACR	Removal Action Completion Report
RPD	Reportable Percent Difference

ACRONYMS AND ABBREVIATIONS (CONTINUED)

SAP	Sampling and Analysis Plan
SoundEarth	SoundEarth Strategies, Inc.
TCE	trichloroethylene
USCS	Unified Soil Classification System

1.0 INTRODUCTION

This Sampling and Analysis Plan and Quality Assurance Project Plan (SAP/QAPP), prepared on behalf of Jorgensen Forge Corporation (JFC) and The Boeing Company (Boeing) presents the organization, objectives, planned activities, and specific quality assurance/quality control (QA/QC) procedures associated with the proposed activities to be conducted as part of the removal action activities described in the Corrugated Metal Pipe (CMP) Work Plan. The work will be conducted on the Jorgensen Forge Outfall Site (JFOS) at 8531 East Marginal Way South in Seattle, Washington (Figure 1).

This SAP/QAPP provides guidance to field, project, and laboratory personnel involved in the removal of CMP and associated soil, to ensure that data quality is maintained. Any future changes to the CMP Work Plan (such as changes in sampling locations, sampling frequency, and/or chemical analyses) will be described in addenda to this SAP/QAPP.

Specific protocols for sampling, sample handling and storage, chain-of-custody, and laboratory and field analyses are described in this SAP/QAPP. This plan was developed in accordance with the Washington State Department of Ecology's (Ecology's) *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies* (Ecology 2004), the U.S. Environmental Protection Agency's *Requirements for Quality Assurance Project Plans* and *Guidance for Quality Assurance Project Plans* (EPA 2001, 2002).

A copy of this SAP/QAPP and the Health and Safety Plan (HASP) will be available in the field when performing the CMP Work Plan activities.

1.1 PROJECT ACTIVITIES

The removal action will include a combination of excavation methods to access and remove overburden soil, the CMPs, and polychlorinated biphenyl (PCB)-contaminated soil. PCB-contaminated is defined as a total PCB concentration greater than 1 part per million (ppm). Planned activities include the removal of the CMPs and surrounding PCB-contaminated soils, and collection of soil confirmation samples from the bottoms the remedial excavations; sidewall soil samples also will be collected from the spot excavation at the location of boring 2-66-SP-10. The work includes collection of samples of the temporary stockpile of backfill soil for TCE and its breakdown products, in coordination with CMP Work Plan Attachment C.

Samples of water generated during construction dewatering will be collected and analyzed in accordance with the King County Industrial Waste Discharge Permit, which will be secured following completion of plans and specifications and receipt of contractor submittals.

1.2 PROJECT SCHEDULE

The timeframes for field work is provided in Section 5.0 of the CMP Work Plan. The timeframe for implementing the field activities is intended to be used as a guide. Adjustments to the implementation dates and the estimated project duration may be necessary to account for variable unforeseen or unavoidable conditions encountered in the field or the laboratory (e.g., inclement weather, difficulties in accessing a sampling site, or additional time needed to complete a task).

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

2.1 ORGANIZATION AND MANAGEMENT

The various management, implementation, field, laboratory, and quality assurance responsibilities of key project personnel are defined below. This SAP/QAPP will be distributed to all key project personnel.

2.1.1 EPA

Mr. Ravi Sanga is EPA Region 10's Remedial Project Manager overseeing the completion of investigation and removal actions proceeding under the Third Modification.

2.1.2 JFC

JFC, the current owner of the Jorgensen Forge Property, is responsible for implementation of this CMP Work Plan, coordination with Boeing, and joint fulfillment of the terms and conditions of the Third Modification between JFC, Boeing, and EPA. JFC's interests are represented by:

- Mr. Miles Dyer is JFC's Acting Director, Environmental Compliance.

Mr. Dyer will designate a SoundEarth Project Manager, who will be responsible for quality assurance on this project and ensure that it meets technical and contractual requirements. The SoundEarth Project Manager's responsibilities will include the following:

- Communicate and coordinate with the JFC, Boeing representatives, Engineer-of-Record, analytical laboratory, and independent data validator.
- Schedule and assign qualified personnel to document completion of field activities and adherence to the project objectives, and identify and communicate variances (if any) from the CMP Work Plan.
- Review field submittals and forms for completeness.
- Review laboratory QA/QC data and data validation reports and qualification of data if/as appropriate.
- Delegate one or more above responsibilities to qualified personnel.

2.1.3 BOEING

Boeing, the current owner of the Plant 2 property, is jointly responsible with JFC for the fulfillment of the terms and conditions of the Third Modification. Boeing's interests are represented by:

- Mr. William Ernst, EO&T, EHS, of Boeing is the manager for RCRA Correction Actions activities conducted at Uplands Areas of Plant 2.

2.1.4 ANALYTICAL RESOURCES, INC. (ARI)

ARI will perform all chemical analytical services in support of the CMP Work Plan activities. ARI will be contacted prior to initiation of sampling collection activities to ensure appropriate sample storage and handing as well as to ensure that the appropriate analytical methods and procedures are performed.

The ARI Project Manager will provide a copy of the QAPP to ARI prior to collection and delivery of samples to the laboratory. Any deviation by the laboratory from the requirements specified in the QAPP requires approval by the ARI Project Manager.

2.2 TRAINING REQUIREMENTS

JFC and Boeing will require that field personnel working inside the Exclusion Zone for this project have current Hazardous Waste Operations and Emergency Response (HAZWOPER) training. The contractors are responsible for on-site records, including employee's certifications. The field personnel's respective employers are responsible for verification of training.

2.3 DOCUMENTATION AND RECORDS

All sample containers will be adequately identified with a durable label, and the sample identification will be recorded on the applicable forms. Sample containers will be labeled with the following information: client, project name and number, date and time sampled, and sample identification. Other sample documentation to be maintained by field personnel includes chain-of-custody forms, daily field reports, and sample summary forms. Field submittals will be uploaded to the electronic project files maintained by SoundEarth Strategies, Inc. (SoundEarth). Examples of these forms are included in Appendix A.

All original project documents will be kept by SoundEarth and following project completion will be electronically archived for a 7-year period following EPA's completion of work notice. The SoundEarth Project Manager will ensure that field personnel possess current copies of the CMP Work Plan, HASP in advance of scheduling field activities.

3.0 SAMPLING PROCEDURES

The scope of sampling under the CMP Work Plan requires the collection of soil confirmation samples. Sample collection and analysis is summarized in Table E.1. Specific requirements for soil sample media are described below.

3.1 SOIL SAMPLING

Confirmation soil samples will be collected from the excavation areas using an excavator bucket or clamshell-type "Van Veen" sampler. Samples may be collected by the field representative or by the contractor and transferred to the field representative.

Samples will be photographed and described in accordance with American Society of Testing and Materials (ASTM) Method D-2488, Standard Practice for Description and Identification of Soils (Visual-Manual Procedure), and assigning United Soil Classification System (USCS) classifications to each sample. As part of sample collection, the following information will be recorded in the daily field report:

- Date, time, and name of the person collecting the sample
- Sample identification number and location
- Sample description, including presence of organic matter or non-native debris if present
- Indications of sheen, odor, or discoloration
- Sample location

Confirmation sample locations are shown on Figure 7 of the CMP Work Plan. Planned easting and northing coordinates for each sample location are summarized in the below table. Sample locations will be located in the field using taped measurements from a survey control stake, within plus or minus one foot of the coordinates listed in the below table. In addition to the confirmation samples, post-construction baseline samples will be collected from the restored surface of the granular excavation backfill material at the same coordinates as confirmation sample location numbers 1, 4, 6, 9, 10, and 11.

Planned Easting And Northing Coordinates For Confirmation Soil Samples			
Sample Position	**Confirmation Sample Location From Figure 7 [(a)]**	**Easting[(1)]**	**Northing[(1)]**
West Bottom, Shored Excavation, Under 12 -inch CMP	1	1275786.5	195806.7
Middle Bottom, Shored Excavation, Under 12-Inch CMP	2	1275798.8	195806.5
East Bottom, Shored Excavation, Under 12-inch CMP	3	1275812.8	195806.3
East Bottom, Shored Excavation, Southern Tier	4	1275814.7	195799.1
Middle Bottom, Shored Excavation, Southern Tier	5	1275803.8	195794.5
West Bottom, Shored Excavation, Southern Tier	6	1275791.7	195791.2
NE Bottom, Trenchbox Excavation under 12-inch CMP	7	1275850.8	195805.8
NW Bottom, Trenchbox Excavation under 12-inch CMP	8	1275836.9	195806.0
SW Bottom, Trenchbox Excavation under 24-inch CMP	9	1275836.9	195800.2
SE Bottom, Trenchbox Excavation under 24-inch CMP	10	1275850.8	195800.0
Bottom, Pothole Excavation at Boring 2-66-SP-10	11	1275845.0	195815.1
North Sidewall, Pothole Excavation at Boring 2-66-SP-10	12	1275845.5	195817.3

Planned Easting And Northing Coordinates For Confirmation Soil Samples			
Sample Position	Confirmation Sample Location From Figure 7 [a]	Easting[1]	Northing[1]
West Sidewall, Pothole Excavation at Boring 2-66-SP-10	13	1275843.5	195815.3
South Sidewall, Pothole Excavation at Boring 2-66-SP-10	14	1275845.5	195813.3
East Sidewall, Pothole Excavation at Boring 2-66-SP-10	15	1275847.5	195815.3

[a] Refer to section 4.1 below for soil confirmation sample identification numbers that correspond to locations 1 through 15.
[1] Northing and easting coordinates relative to North American Datum, 1983.

3.2 QUALITY CONTROL SAMPLES

The scope of quality control sampling will include field blanks. Trip blanks will be used only if samples need to be analyzed for TCE or its breakdown products.

3.2.1 Field Duplicate Samples

Field duplicate samples are collected at a frequency of approximately 5 percent or a fraction thereof of the total number of soil samples and/or the number of water samples per sampling event, exclusive of other QC samples. Field duplicate samples are collected under conditions as identical as reasonably possible to the original sample, to evaluate sampling precision.

No soil field duplicate samples will be collected in connection with this scope of work, due to the variability of soil texture, soil matrix interference issues, poor reproducibility of soil analytical results in heterogeneous soil media, and/or collection of soil samples from surfaces that are submerged below the water table.

3.2.2 Field Equipment Rinsate Blanks

No water samples will be collected in connection with this scope of work, exclusive of other QC samples (e.g. rinsate and trip blanks) and treatment system effluent (construction dewatering water) samples; The number and frequency of wastewater samples will be collected in accordance with the King County Industrial Waste Discharge Permit requirements, for the purpose of assessing the effectiveness of the treatment system and documenting compliance with facility discharge criteria. No field duplicate water samples will be collected in connection with treatment system effluent sampling and analysis.

Equipment rinsate blank samples will be obtained at a frequency of 5 percent during soil sampling (described in Section 3.1). Rinsate blanks will consist of laboratory-supplied deionized water passed over and/or through decontaminated sampling equipment. Water samples will be collected directly into sample containers without using sampling equipment; otherwise, equipment rinsate blank samples will be collected for water only if re-useable equipment is used during sample collection.

3.2.3 Trip Blanks

If soil or water samples require analysis for TCE or its breakdown products, a trip blank will be included in each cooler that contains samples for TCE analysis. The trip blank and sample(s) will be analyzed to ensure that the sample containers do not contribute to any detected analyte concentrations and to identify any artifacts of improper sample handling, storage, or shipping.

3.3 DECONTAMINATION PROCEDURES

At a minimum, decontamination of re-useable materials and equipment will be in accordance with Section 761.79 of the Code of Federal Regulations and the procedures described in Attachment D of the CMP Work Plan.

3.4 WASTE HANDLING AND DISPOSAL

Wastes derived during all field activities will be managed and disposed of in accordance with applicable waste management regulations. Generation of the following wastes is anticipated:

- Excavated soil
- Water pumped from the excavation (construction dewatering water)
- Storage tank suspended solids
- Disposable materials used during field work that are impacted by contaminated soil or water (e.g., disposable personal protective equipment, plastic sheeting, paper towels, etc.)
- Decontamination wash water and rinsate

Wastes produced during field activities will be assumed to be contaminated and will be containerized. Excavated soil has already been profiled for direct-loading and off-site disposal. Waste water will be contained on-site and sampled, and treated if required, under a King County Industrial Waste Discharge Permit, prior to discharge to sanitary sewer discharge. Otherwise, waste samples will be collected from the container for characterization. The waste water analytical program (number, frequency, and scope) will be defined by King County, and likely will include field measurement for water quality parameters and laboratory analysis for COCs such as:

- PCBs
- Fats, oils, and greases (FOG) by EPA Method 418.1, or equivalent total petroleum hydrocarbon method
- Total suspended solids (TSS)

In response to EPA's October 29, 2015, comment nos. 42, 47, 53, and 55, and as indicated in Tables E-1, E-2, and E-3, waste water samples also will be analyzed for TCE and its breakdown products. Soil backfill that will be temporarily excavated and stockpiled on Plant 2 to relieve pressure on the north side of the 2-66 sheet pile wall will be sampled and analyzed for TCE prior to re-emplacement, consistent with Appendix C of the CMP Work Plan and supplemental to the initial characterization results provided in Appendix F of the CMP Work Plan. Otherwise, standard treatment of construction dewatering water is expected to address TCE and its breakdown products in water.

Disposable materials generated during field work will be combined with containerized soil for off-site disposal when impacted by waste, contaminated groundwater, or decontamination wash water. All disposable materials and PPE will be managed and disposed as Subtitle D waste.

3.5 LOCATION CONTROL

Disposable materials that have not contacted waste, contaminated soil, or contaminated water, or do not contain significant volumes of contaminant (e.g., gloves) may be disposed of as conventional refuse at the discretion of the field personnel.

Horizontal survey control points relative to North American Datum 1983 will be established in the field to serve as location references during construction and sampling activities. The bottoms of the shored and unshored excavations will not be safely accessible by workers; therefore, confirmation sample locations will be tape-measured relative to a survey control point, and northing and easting values will be calculated for each sample by adding or subtracting the field measurement from the control point northing and easting. Sample depths will be measured as elevations relative to North American Vertical Datum 1988.

4.0 SAMPLE HANDLING AND CUSTODY DOCUMENTATION

Sample possession and handling must be traceable from the time of sample collection, through laboratory and data analysis, to the time sample results are reported. In addition to the laboratory chain-of-custody form, a sample log form will be completed and attached to the daily field report for each day that samples are collected.

4.1 SAMPLE HANDLING

To control the integrity of the samples during transit to the laboratory and prior to analysis, established preservation and storage measures will be taken. Sample containers will be labeled with the client name, project number, sample number, sampling date and time, required analyses, and initials of the individual that collected the sample. The field representative will check all container labels, custody form entries, and daily field reports for completeness and accuracy at the end of each sampling day.

All samples collected for this project will be labeled with a unique identification number. Soil samples will be numbered according to the following format: project – media – preassigned sample number – elevation. Other information to be documented on each container label includes the sample date, time, requested analyses. Identification numbers and definitions for each sample type are as follows:

Soil Confirmation Samples

Excavation ID:	• 266 (for pothole excavation at the location of boring 2-66-SP-10) • CMP12/CMP24 (for sample collected from trenchbox portion of the CMP removal excavation • JFOS3 (main shored excavation)
Bottom or Sidewall Designation:	B for Bottom, N for East Sidewall, W for West Sidewall, S for South Sidewall, E for East Sidewall
Confirmation Sample Location Number:	1 through 15 (as numbered on Figure 7 in the CMP Work Plan, or work plan addendum as appropriate, and in the "Planned Easting and Northing Coordinates" table presented in Section 3.1, under the column named "Confirmation Sample Location No. from Figure 7")
Number of Samples Collected from Same Location:	1 for the first sample collected from the stated coordinates, 2 for the second sample collected from the same coordinates, etc.
Elevation:	+15 through -16 feet (two digits)
Example Labels:	CMP24-B09-1+5 Confirmation soil sample collected from the trenchbox excavation under the 24-inch CMP, from the bottom of the excavation, location number 9, first sample at that location, at an approximate Elevation +5 feet. JFOS3-B06-1

Post-Construction Baseline Samples

Project ID:	JFOS3
Designation:	PC (Post-Construction)
Location Number:	From Figure 7 in the CMP Work Plan, or work plan addendum as appropriate
Elevation:	+15 through -16 feet (two digits)
Example Label:	JFOS3-PC09+15 Post-construction baseline sample collected from location number 09 at approximate Elevation +15 feet.

Field Quality Control

Equipment Rinsate	R
Example Label:	JFOS3-B03 R, rinsate sample from soil sample identified above.

4.2 CHAIN-OF-CUSTODY

Chain-of-custody procedures will be strictly followed to provide an accurate written record of the possession of each sample from the time it is collected in the field through laboratory analysis. Adequate sample custody will be achieved by means of approved field and analytical documentation. Such documentation includes the chain-of-custody form, which is initially completed by the sampler and is thereafter signed by those individuals who accept custody of the sample. A sample will be considered to be in custody if it is:

- in someone's physical possession.

- in someone's view.
- secured in a locked container or vehicle or otherwise sealed so that any tampering would be evident.
- kept in a secured area, restricted to authorized personnel only.

The laboratory will provide sufficient copies of blank chain-of-custody forms. All sample information (i.e., sample date/time, sample matrix, number of containers, etc.), including all required analyses, will be logged onto a chain-of-custody form prior to formal transfer of sample containers to the analytical laboratory. Whenever possession of the samples is transferred, the individuals relinquishing and receiving the samples will respectively sign, date, and note the time of transfer on the chain-of-custody form. This form documents the transfer of custody of samples from the sampler to the laboratory.

The person responsible for transfer/transport of the samples to the laboratory will complete and sign the chain-of-custody form, keeping a copy for future reference. The sampler will place the original form in a clear zip-lock bag inside the sample cooler with the samples. One chain-of-custody form will be completed and placed inside each individual cooler. Whenever practical, a member of the sample team will personally hand-deliver samples to the laboratory; otherwise, custody seals will be used in the event that a courier or shipper is used to deliver the cooler to the laboratory.

4.3 SAMPLE PRESERVATION

Table E.2 summarizes sample size requirements, container type, preservation method, and holding times for analytes. Samples requiring field preservation will be placed into pre-preserved sample containers supplied by the laboratory. Immediately after the sample jars are filled, they will be placed in the appropriate cooler with a sufficient number of ice packs (or crushed ice) to keep them cool through transport to the laboratory. All samples will be preserved by keeping cool to 6°C. Following analysis, remaining samples may be preserved by freezing.

Waste water samples collected in connection with the King County Industrial Waste Discharge Permit will be contained and preserved in accordance with the method(s) specified in the permit. In the event that the permit specifies additional analytes that are not anticipated at this time, then Tables E-1, E-2 and E-3 will be updated to include sample size requirements, container types, preservation methods, and holding times for those analytes.

4.4 SAMPLE TRANSPORT AND SHIPMENT

Technical field personnel will be responsible for sample tracking and custody procedures in the field. The SoundEarth Project Manager will be responsible for final sample inventory and will maintain sample custody documentation. At the end of each day, and prior to transfer, custody form entries will be made for all samples. Each sample cooler will be accompanied by a chain-of-custody form. Copies of forms will be retained and included as appendices to QA/QC reports to management.

Prior to transport and/or shipping, sample containers will be wrapped and securely packed inside the cooler with ice packs or double-bagged ice by the field representative. The original, signed custody forms will be transferred with the cooler. Samples will be delivered to the laboratory under custody following completion of sampling activities on a daily basis, or at maximum every other day. Custody seals will be used in the event that a courier or shipper must be used to deliver the cooler to the laboratory.

4.5 SAMPLE RECEIPT

The designated sample custodian at the laboratory will accept custody of the samples and verify that the chain-of-custody form matches the samples received. The ARI Project Manager will ensure that the custody forms are properly signed upon receipt of the samples and will note questions or observations concerning sample integrity on the custody forms. The laboratory will contact the SoundEarth Project Manager immediately if discrepancies are discovered between the custody forms and the sample shipment upon receipt. The ARI Project Manager, or designee, will specifically note any coolers that do meet sample preservation requirements.

5.0 QUALITY ASSURANCE OBJECTIVES

5.1 LABORATORY ANALYSIS PROGRAM

5.1.1 Contract Laboratory Requirements

In completing chemical analyses for this project, the contract laboratory is expected to meet the following minimum requirements:

- Adhere to the methods outlined in the QAPP, including methods referenced for each analytical procedure.
- Deliver fax, hard copy, and electronic data as specified.
- Meet reporting requirements for deliverables.
- Meet turnaround times for deliverables.
- Implement QA/QC procedures, including the QAPP data quality requirements, laboratory QA requirements, and performance evaluation testing requirements.
- Allow laboratory and data audits to be performed, if deemed necessary.

5.1.2 Chemical Analyses

Samples will be analyzed for the constituent groups using the methods presented in Table E.2. All chemical analyses will be performed by ARI. Current laboratory certification is provided in Appendix B. Accreditation certificates will be updated if sampling and analysis activities occur after the current expiration date of May 11, 2016.

5.1.2.1 Reporting Limits

The analytical methods identified in this SAP/QAPP result in the lowest analytically achievable method detection limits and reporting limits or Practical Quantitation Limits (PQLs). Table E.2 presents the target reporting limits for each analytical method as performed by ARI. These reporting limits are goals only, insofar as instances may arise where high sample concentrations, non-homogeneity of samples, or matrix interferences preclude achieving the desired reporting limit and associated QC criteria. In such instances, the laboratory will report the reason for any deviation from these reporting limits.

5.1.2.2 Sample Archival

Remaining sample volumes may be archived in a laboratory freezer at a temperature range of -10 to -20 degrees Fahrenheit in the event that additional analysis is needed.

5.2 LABORATORY QUALITY ASSURANCE OBJECTIVE

This SAP/QAPP establishes QC procedures and QA criteria to meet the data quality objectives (DQOs) set forth for the field activities to be conducted at the Site. The overall QA objective is to specify laboratory procedures for ensuring that data quality is maintained for field sampling, chain of custody, laboratory analyses, and reporting.

5.2.1 Laboratory Data Quality Objectives

The DQOs for the work described in this SAP/QAPP are to obtain the type and quantity of data in a manner such that the data are of known, appropriate, and sufficient quality to support the intended use.

Analytical DQOs include obtaining data that are technically sound and properly documented, having been evaluated against established criteria for the principle data quality indicators (i.e., precision, accuracy, representativeness, completeness, and comparability) as defined in Ecology and EPA guidance (Ecology 2004 and EPA 1998).

5.2.1.1 Precision

Precision measures the reproducibility of measurements under a given set of conditions. Specifically, precision is a quantitative measure of the variability of a group of measurements compared to their average values. Analytical precision is measured through matrix spike/matrix spike duplicate (MS/MSD) samples for organic analysis and through laboratory duplicate samples for inorganic analyses.

Analytical precision measurements will be carried out on project-specific samples at a minimum frequency of 1 per laboratory analysis group or 1 in 20 samples, whichever is more frequent per matrix analyzed, as practical. Laboratory precision will be evaluated against quantitative relative percent difference (RPD) performance criteria.

Field precision will be evaluated by the collection of blind field duplicates at a minimum frequency of 1 per laboratory analysis group or 1 in 20 samples; however, no data will be qualified based solely on field duplicate precision.

Precision measurements can be affected by the nearness of a chemical concentration to the method detection limit, where the percent error (expressed as RPD) increases. The equation used to express precision is as follows:

$$RPD = \frac{(C_1 - C_2) \times 100\%}{\frac{(C_1 + C_2)}{2}}$$

Where:

RPD = relative percent difference

C_1 = larger of the two observed values

C2 = smaller of the two observed values

5.2.1.2 Accuracy

Accuracy is an expression of the degree to which a measured or computed value represents the true value. Analytical accuracy may be assessed by analyzing "spiked" samples with known standards (surrogates, laboratory control samples, and/or matrix spike) and measuring the percent recovery. Accuracy measurements on matrix spike (MS) samples will be carried out at a

minimum frequency of 1 in 20 samples per matrix analyzed. Because MS/matrix spike duplicates (MSD) measure the effects of potential matrix interferences of a specific matrix, the laboratory will perform MS/MSD only on samples from this investigation and not from other projects. Surrogate recoveries will be determined for every sample analyzed for organics. The acceptable accuracy ranges for the analytes included in this investigation are presented in Table E.3. Should the percent recoveries be outside the acceptable range, using professional judgment, data may be J-flagged as estimated concentrations.

Laboratory accuracy will be evaluated against quantitative laboratory control sample, matrix spike, and surrogate spike recoveries using limits for each applicable analyte. Accuracy can be expressed as a percentage of the true or reference value, or as a percent recovery in those analyses where reference materials are not available and spiked samples are analyzed. The equation used to express accuracy is as follows:

$$\%R = 100\% \times \frac{(S-U)}{C_{sa}} \%R = 100\% \text{ x } (S\text{-}U)/C$$

Where:

%R = percent recovery
S = measured concentration in the spiked aliquot
U = measured concentration in the unspiked aliquot
C_{sa} = actual concentration of spike added

5.2.1.3 Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Care will be taken in the design of the sampling program to ensure that sample locations are selected properly, sufficient numbers of samples are collected to accurately reflect conditions at the location(s), and samples are representative of the sampling location(s). A sufficient volume of sample will be collected at each sampling location to minimize bias or errors associated with sample particle size and heterogeneity. Selected analytes were identified as constituents of concern (COCs) based on previous sampling investigations.

5.2.1.4 Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Comparability of the data will be maintained by following applicable protocols. The use of standard techniques for both sample collection and laboratory analysis should make the collected data comparable to both internal and other data generated. Comparability with previously generated data will be assessed as part of the work. Selected analytes were identified as COCs based on previous sampling investigations.

5.2.1.5 Completeness

Completeness is a measure of the amount of data that is determined to be valid in proportion to the amount of data collected. Completeness will be calculated as follows:

$$C = \frac{(Number\ of\ acceptable\ data\ points) \times 100}{(Total\ number\ of\ data\ points)}$$

The DQO for completeness for soil sampling performed in connection with this project is 90 percent. Data that were qualified as estimated because the QC criteria were not met will be considered valid for the purpose of assessing completeness. Data that were qualified as rejected will not be considered valid for the purpose of assessing completeness.

5.3 QUALITY CONTROL PROCEDURES

Sampling procedures for this investigation are described in Section 3.0. The following sections discuss the field and laboratory quality control procedures that will be followed for this investigation.

5.3.1 Field Quality Control Procedures

A rinsate blank QC sample will be collected on the soil confirmation sampling equipment (i.e. excavator bucket or clamshell-type sampler) to ensure that field decontamination procedures are effective. All field QC samples will be documented in the daily field reports and verified by the QA Manager or designee.

5.3.2 Laboratory Quality Control Procedures

Laboratory Quality Control Criteria. Results of the QC samples from each sample group will be reviewed by the analyst immediately after a sample group has been analyzed. The QC sample results will then be evaluated to determine whether control limits were exceeded. If control limits are exceeded in the sample group, corrective action (e.g., method modifications followed by reprocessing the affected samples) will be initiated prior to processing a subsequent group of samples.

All primary chemical standards and standard solutions used in this project will be traceable to documented and reliable commercial sources. Standards will be validated to determine their accuracy by comparison with an independent standard. Any impurities identified in the standard will be documented.

The following paragraphs summarize the procedures that will be used to assess data quality throughout sample analysis.

Laboratory Duplicates. Analytical duplicates provide information on the precision of the analysis and are useful in assessing potential sample heterogeneity and matrix effects. Analytical duplicates are subsamples of the original sample that are prepared and analyzed as a separate sample. A minimum of 1 duplicate will be analyzed per sample group or for every 20 samples, whichever is more frequent.

Matrix Spikes and Matrix Spike Duplicates. Analysis of MS samples provides information on the extraction efficiency of the method on the sample matrix. By performing MSD analyses, information on the precision of the method is also provided for organic analyses. A minimum of 1 MS/MSD will be analyzed for every sample group or for every 20 samples, whichever is more frequent.

Laboratory Control Samples. A laboratory control sample (LCS) is a method blank sample carried throughout the same process as the samples to be analyzed, with a known amount of standard added. The blank spike compound recovery assesses analytical accuracy in the absence of any sample heterogeneity or matrix effects.

Surrogate Spikes. All project samples analyzed for organic compounds will be spiked with appropriate surrogate compounds as defined in the analytical methods. Surrogate recoveries

will be reported by the laboratories; however, no sample result will be corrected for recovery using these values.

Method Blanks. Method blanks are analyzed to assess possible laboratory contamination at all stages of sample preparation and analysis. A minimum of 1 method blank will be analyzed for every extraction batch or for every 20 samples, whichever is more frequent.

5.4 INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE

Field equipment will be inspected and calibrated, following instrument manufacturers' directions, by the field representative prior to any use on the project.

5.5 INSTRUMENT/EQUIPMENT CALIBRATION AND FREQUENCY

Initial and continuing calibration will be performed in accordance with each analytical method requirement. Multipoint initial calibration will be performed on each instrument at the start of the project, after each major interruption to the analytical instrument, and when any ongoing calibration does not meet control criteria. Ongoing calibration will be performed daily for metals and organic analyses and with every sample batch for conventional parameters (when applicable) to track instrument performance.

Instrument blanks or continuing calibration blanks provide information on the stability of the baseline established. Continuing calibration blanks will be analyzed immediately following continuing calibration verification at a frequency of 1 continuing calibration blank for every 10 samples analyzed at the instrument for inorganic analyses and every 12 hours for organic analyses. If the ongoing calibration is out of control, the analysis must come to a halt until the source of the control failure is eliminated or reduced to meet control specifications. All project samples analyzed while instrument calibration was out of control will be reanalyzed.

5.6 INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

There are no "critical" project supplies and consumables that may directly or indirectly affect the quality of the data results.

5.7 NON-DIRECT MEASUREMENTS

There are not any "non-direct measurement sources" that have been identified that will provide data to the project. All data will be directly measured and generated during project field activities.

6.0 DATA REDUCTION, VALIDATION, AND MANAGEMENT

Initial data reduction, evaluation, and reporting at the laboratory will be carried out as described in the appropriate analytical protocols and the laboratory's QA Manual. QC data resulting from methods and procedures described in this document will also be reported.

6.1 DATA REDUCTION AND LABORATORY REPORTING

The laboratory will be responsible for internal checks on data reporting and will correct errors identified during the QA review. Close contact will be maintained with the laboratories to resolve any QC problems in a timely manner. The analytical laboratories will be required, where applicable, to report the following:

- **Project/Case Narrative.** This summary, in the form of a cover letter, will discuss problems, if any, encountered during any aspect of analysis. This summary should discuss, but not be limited to, QC, sample transport/shipment, sample storage, and analytical difficulties. Any problems encountered (actual or perceived) and their resolutions will be documented in as much detail as necessary.
- **Sample Identification Numbers.** Records will be produced that clearly match all blind duplicate QA samples (if any) with laboratory sample identification numbers.
- **Chain-of-Custody Forms.** Legible copies of the custody forms will be provided as part of the data package. This documentation will include the time of receipt and condition of each sample received by the laboratory. Additional internal tracking of sample custody by the laboratory will also be documented.
- **Sample Results.** The data package will summarize the results for each sample analyzed. The summary will include the following information when applicable:
  - Field sample identification code and the corresponding laboratory identification code:
  - Sample matrix.
  - Date of sample extraction.
  - Date and time of analysis.
  - Weight and/or volume used for analysis.
  - Final dilution volumes or concentration factor for the sample.
  - Percent moisture in solid samples.
  - Identification of the instrument used for analysis.
  - Method reporting and quantitation limits.
  - Analytical results reported with reporting units identified.
  - All data qualifiers and their definitions.
  - Electronic data deliverables (EDDs).
- **Quality Assurance/Quality Control Summaries.** This section will contain the results of all QA/QC procedures. Each QA/QC sample analysis will be documented with the same information required for the sample results (refer to above). No recovery or blank corrections will be made by the laboratory. The required summaries are listed below; additional information may be requested.
- **Method Blank Analysis.** The method blank analyses associated with each sample and the concentration of all compounds of interest identified in these blanks will be reported.
- **Surrogate Spike Recovery.** All surrogate spike recovery data for organic compounds will be reported. The name and concentration of all compounds added, percent recoveries, and range of recoveries will be listed.

- **Matrix Spike Recovery.** All matrix spike recovery data for metals and organic compounds will be reported. The name and concentration of all compounds added, percent recoveries, and range of recoveries will be listed. The RPD for all duplicate analyses will be reported.
- **Matrix Duplicate.** The RPD for all matrix duplicate analyses will be reported.
- **Blind Duplicates.** Blind duplicates (if any) will be reported in the same format as any other sample. RPDs will be calculated for duplicate samples and evaluated as part of the data quality review.

6.2 DATA VALIDATION

All sampling and analysis performed pursuant to the Order shall conform to EPA direction, approval, and guidance regarding sampling, QA/QC, data validation and chain-of-custody procedures. Laboratories used shall participate in a QA/QC program and has a documented quality system that complies with the appropriate EPA guidance. SoundEarth will review the laboratory reports for internal consistency, transmittal errors, laboratory protocols, and for adherence to the DQOs as specified in this SAP/QAP, including the following parameters:

- Evaluation of package completeness.
- Verification that sample numbers and analyses match those requested on the Chain-of-Custody Form.
- Review of method-specified preservation and sample holding times.
- Verification that the required detection limits and reporting limits have been achieved.
- Verification that the field duplicates, MS/MSDs, and laboratory control samples were analyzed at the proper frequency.
- Verification of analytical precision and accuracy via replicate analysis and analyte recoveries.
- Verification that the surrogate compound analyses have been performed and meet QC criteria.
- Verification that the laboratory method blanks were free of contaminants.

A Stage 2B Data Quality Review (Summary Validation) using an outside qualified vendor will be performed on the remaining analytical data collected during implementation of the CMP Work Plan. In addition to the above-listed parameters, the Stage 2B Data Quality Review (Summary Validation) includes additional review of instrument performance—initial calibration, continuing calibration, tuning, sensitivity, and degradation. Stage 2B Data Quality Review will be performed by a qualified subcontractor. The summary report from the outside vendor will be reviewed and approved by the SoundEarth Project Manager.

Data validation will be based on the QC criteria as recommended in the methods identified in this SAP/QAPP and in the National Functional Guidelines for Organic and Inorganic Data Review (EPA 2008 and 2004).

Data usability, conformance with the DQOs, and any deviations that may have affected the quality of the data, as well as the basis of application of qualifiers, will be included in the final reporting of the data. Any required corrective actions based on the evaluation of the analytical data will be determined by the ARI Project Manager and Data Validator in consultation with the SoundEarth Project Manager and may include qualification or rejection of the data.

6.3 DATA MANAGEMENT

Analytical laboratory data will be received in an electronic data deliverable (EDD) format suitable for import into a project-specific database. Both laboratory data qualifiers and external data validation qualifiers will be stored in the database. Northing and easting values will be calculated for each sample location and included in the database. All numerical data such as coordinates, concentration values, distances, depths will be entered into the Excel spreadsheet as numbers.

7.0 LABORATORY AUDITS AND CORRECTIVE ACTIONS

Laboratory and field performance audits and corrective action procedures are described in this section.

7.1 LABORATORY AND FIELD PERFORMANCE AUDITS

Laboratory and field performance audits will consist of on-site reviews of quality assurance systems and equipment for sampling, calibration, and measurement. Laboratory audits will not be conducted as part of this study; however, all laboratory audit reports will be made available to the SoundEarth Project Manager upon request. The laboratory is required to have written procedures addressing internal QA/QC. The laboratory must ensure that personnel engaged in all sample logging and analyses tasks have appropriate training.

The laboratory will, as part of the audit process, provide for consultant's review, written details of any and all method modifications planned.

7.2 CORRECTIVE ACTIONS FOR FIELD SAMPLING

The SoundEarth Project Manager will be responsible for correcting field errors in sampling or documenting equipment malfunctions during the field sampling effort. The SoundEarth Project Manager will be responsible for resolving situations in the field that may result in non-compliance with this SAP/QAPP. All corrective measures will be immediately documented the applicable daily field report.

7.3 CORRECTIVE ACTIONS FOR LABORATORY ANALYSES

The laboratory is required to comply with their Standard Operating Procedures and the requirements of the EPA analytical methods, as specified in this SAP/QAPP. The ARI Project Manager will be responsible for ensuring that appropriate corrective actions are initiated as required for conformance with this SAP/QAPP. All laboratory personnel will be responsible for reporting problems that may compromise the quality of the data.

If any QC sample exceeds the project-specified control limits, the analyst will identify and correct the anomaly before continuing with the sample analysis. The analyst will document the corrective action taken in a memorandum submitted to the SoundEarth Project Manager. A narrative describing the anomaly, the steps taken to identify and correct the anomaly, and the treatment of the relevant sample batch (i.e., recalculation, reanalysis, and/or re-extraction) will be submitted with the data package.

8.0 DATA REPORTING

Following completion of field activities a Removal Action Completion Report (RACR) will be prepared and submitted to EPA. The RACR will include the following:

- A description of the purpose and goals of the investigation.
- A summary of the field sampling and laboratory analytical procedures.
- A summary of contractor field procedures and documentation of task completion.
- A general vicinity map showing the location of the Site and a sampling location map. Coordinates (i.e., latitude and longitude and state plane coordinates) for the sampling locations will be reported in an accompanying table.
- Data tables for all media summarizing the chemical and conventional analytical results, as well as pertinent QA/QC data. The data tables will include sample location numbers, sample IDs, dates of sample collection, depth of sample collection, and whether the sample was a duplicate or other QC sample.
- QA reports and laboratory data reports as appendices or attachments.
- Copies of photographs and Chain-of-Custody Forms as appendices or attachments.
- An account of quantities and types of materials removed off-site or handled onsite.
- A discussion of removal and disposal options considered for those materials.
- A listing of the ultimate destinations of those materials.

Accompanying appendices including all relevant documentation generated during the removal action (e.g., manifests, invoices, bills, contracts, and permits).The report will also include a certification signed by the SoundEarth Project Manager that the information provided in the report is true, accurate, and complete.

9.0 REFERENCES

U. S. Environmental Protection Agency (EPA). 1998. *USEPA Guidance Document for Quality Assurance Project Plans.* Publication EPA QA/G-5, EPA/600/R-98/018.

_____. 2001. *Requirements for Quality Assurance Project Plans.* EPA QA/R-5. March.

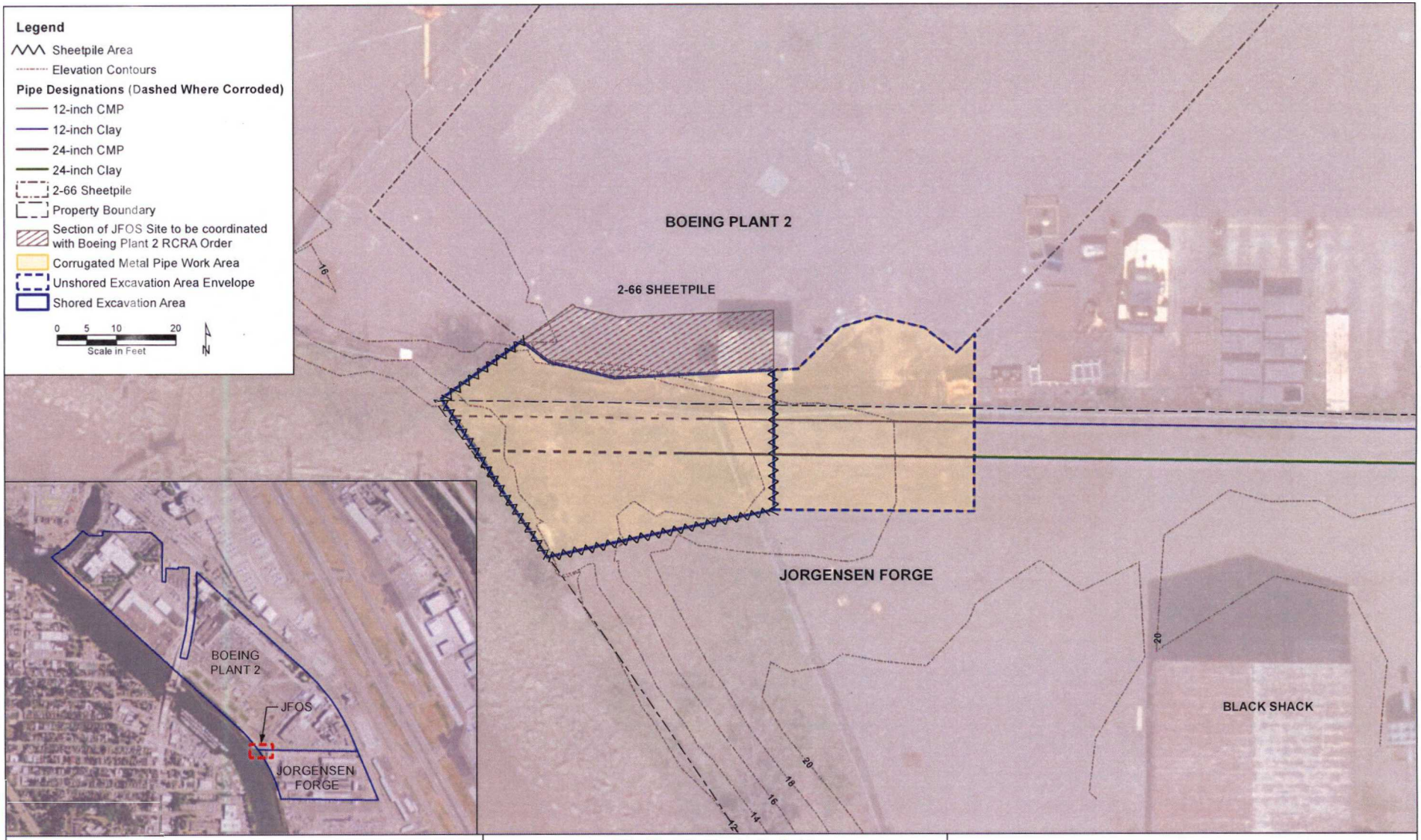
_____. 2002. *Guidance for Quality Assurance Project Plans.* EPA QA/G-5. December.

_____. 2004. *USEPA National Contract Laboratory Program National Functional Guidelines for Inorganic Data Review.* OSWER 9240.1-45, EPA 540-R-04-004. Office of Superfund Remediation and Technology Innovation (OSRTI), Washington, D.C. October.

_____. 2008. *USEPA Contract Laboratory Program, National Functional Guidelines for Organic Data Review.* EPA-540/R-99/008. October.

Washington State Department of Ecology (Ecology). 2004. *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies.* Publication No. 04-03-030. Revision of Publication No. 01-03-003. July.

FIGURE



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Third Modification to the Order
Jorgensen Forge Outfall Site
Seattle, Washington
CERCLA Docket No. 10-2011-0017

Figure 1
Boundary, Topography, and Existing Site Features Map

I:\GIS\Projects\BOE-PL2\MXD\JFOS\RAWP\Figure 1 Boundary Topography and Existing Site Features.mxd
8/12/2015

TABLES

SoundEarth Strategies

Sampling and Analysis Plan/Quality Assurance Project Plan Tables
Third Modification to the Order
Jorgensen Forge Outfall Site
Seattle, Washington
CERCLA Docket No. 10-2011-0017

Table E-1
Sample Collection and Analysis Summary

Task	Number of Samples	Location[1]	Sampling Method	Analyte(s)	Analytical Method
Soil Confirmation Sampling	9 (plus 1 rinsate sample)	Bottom or Sidewalls of Unshored Excavation	Excavator Bucket	PCBs[2]	EPA Method 8082A
	6 (plus 1 rinsate sample)	Bottom of Shored Excavation	Clamshell-Type Sampler	PCBs[2]	EPA Method 8082A
Post-Construction Baseline Sampling	6	Surface of Granular Backfill	Hand/Grab	PCBs[2]	EPA Method 8082A
Analysis of Plant 2 Backfill Material	3 (plus 1 trip blank)	Plant 2 Stockpile	EPA Method 5035A	TCE	EPA Method 8260C
Water Rinsate Samples	2	Sampling Equipment, Post-Decontamination	Hand-Pour/Grab	PCBs[2]	EPA Method 8082A
Water Trip Blank	1	Lab Provided	Lab Provided	TCE	EPA Method 8260C
Water[3]	Batch	Sample Port for Construction Treatment System	Spigot/Grab	PCBs[2]	EPA Method 8082A
	Batch	Sample Port for Construction Treatment System	Spigot/Grab	FOG or equivalent	EPA Method 1664B or equivalent[4]
	Batch	Sample Port for Construction Treatment System	Spigot/Grab	TCE	EPA Method 8260C
	Batch	Sample Port for Construction Treatment System	Spigot/Grab	TSS	EPA Method 2540D

Table E-2
Analytical Requirements, Methods, Preservation, Container Type, and Holding Times

Media	Analysis	Method	Reporting Limit[5]	Container Type	Preservative(s)	Holding Time
Soil	PCBs[2]	EPA Method 8082A	20.0 µg/kg	One, 4- or 8-ounce glass jar	Cool to < 6°C	None; 40 Days for Extracts (per ARI)
	TCE	EPA Method 8260C	1.00 µg/kg	Three, 40 ml VOA vials	$Na_2S_2O_3$; Cool to < 6°C	14 Days
Water[3]	PCBs[2]	EPA Method 8082A	1 µg/L	One, amber Liter	Cool to < 6°C	7 Days for Extraction
	FOG	EPA Method 1664B or equivalent[4]	5.0 mg/L	One, amber Liter	H_2SO_4; Cool to < 6°C	28 Days
	TCE	EPA Method 8260C	0.200 µg/L	Three, 40 ml VOA vials	HCl; Cool to < 6°C	14 Days
	TSS	EPA Method 160.2	1.00 mg/L	One, 1,000 mL HDPE	Cool to < 6°C	7 Days

Table E-3
Accuracy, Precision, and Completeness Goals

Media	Analysis	Method	Reporting Limit[3]	Accuracy MS and LCS (Percent Recovery)	Precision Duplicate of MS/MSD (Replicate RPD)	Completeness
Soil	PCBs[2]	EPA Method 8082A	20.0 µg/kg	52 -120	30%	90%
	TCE	EPA Method 8260C	1.00 µg/kg	80 - 120	30%	90%
Water[3]	PCBs[2]	EPA Method 8082A	1 µg/L	62 - 120	30%	NA
	FOG (or TPH)	EPA Method 1664B (or equivalent)[3]	5.0 mg/L	78 - 114	11%	NA
	TCE	EPA Method 8260C	0.200 µg/L	80 - 120	30%	NA
	TSS	EPA Method 160.2	1.00 mg/L	NA	NA	NA

NOTES:

[1] Refer to Figure 7 of the CMP Work Plan for confirmation sample locations.

[2] PCB Aroclors 1221, 1232, 1016, 1242, 1248, 1254, 1260, 1262, and 1268 .

[3] Effluent water may be subject to supplemental analysis in accordance with King County industrial waste discharge permit to be obtained by the owner following receipt of contractor submittals.

[4] Equivalent total petroleum hydrocarbon analysis subject to approval by King County.

[5] The Reporting Limit is defined as the lowest value at which quantitative detection of a given Aroclor is reported.

ABBREVIATIONS:

°C = degrees celsius
µg/kg = micrograms per kilogram
µg/L = micrograms per liter
ARI = Analytical Resources, Inc.
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
CMP = Construction Management Plan

ABBREVIATIONS (CONTINUED):

EPA = U.S. Environmental Protection Agency
FOG = fats, oils, and greases
H_2SO_4 = sulfuric acid
HCl = hydrochloric acid
HDPE = high-density polyethylene
LCS = labaoratory control sample
mg/kg = milligrams per kilogram
mg/L = milligrams per liter
MS = matrix spike
MSD = matrix spike duplicate
NA = not applicable
$Na_2S_2O_3$ = sodium thiosulfate
PCBs = polychlorinated biphenyls
RPD = reportable percent difference
TCE = trichloroethylene
TPH = total petroleum hydrocarbons
TSS = total suspended solids

APPENDIX A
FIELD FORMS

SoundEarth Strategies

FIELD REPORT

Client & Site Name/Number:		SoundEarth Project Number:	Date:
Site Address:		Purpose of Visit/Task #:	Field Report Prepared by:
Temp/Weather:	Permit Required to Work:	Time of Arrival/Departure (2400): _____ onsite to _____ offsite	Personnel Onsite:

Attachments:

SoundEarth Strategies

Sample Summary Form

Project Name: ______________________ Date: ______________

Project Number: ______________________

Sample Name	Date Collected	Time Collected	Location	PID (ppm)	Odors	Observations

Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number:	Turn-around Requested:	Page:	of
ARI Client Company:	Phone:	Date:	Ice Present?
Client Contact:		No. of Coolers:	Cooler Temps:
Client Project Name:			
Client Project #:	Samplers:		

Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)
www.arilabs.com

Sample ID	Date	Time	Matrix	No Containers	Analysis Requested								Notes/Comments

Comments/Special Instructions	Relinquished by (Signature)	Received by (Signature)	Relinquished by (Signature)	Received by (Signature)
	Printed Name	Printed Name	Printed Name	Printed Name
	Company	Company	Company	Company
	Date & Time	Date & Time	Date & Time	Date & Time

Limits of Liability: *ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.*

Sample Retention Policy: All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.

APPENDIX B

LABORATORY CERTIFICATION

(To be updated if work occurs after May 2016)

OREGON

Environmental Laboratory Accreditation Program

NELAP Recognized

Analytical Resources Inc.

WA100006

4611 S. 134th Place, Suite 100

Tukwila,WA 98168-3240

IS GRANTED APPROVAL BY ORELAP UNDER THE 2009 TNI STANDARDS, TO PERFORM ANALYSES ON ENVIRONMENTAL SAMPLES IN MATRICES AS LISTED BELOW :

Air	*Drinking Water*	*Non Potable Water*	*Solids and Chem. Waste*	*Tissue*
		Chemistry	Chemistry	Chemistry

AND AS RECORDED IN THE LIST OF APPROVED ANALYTES, METHODS, ANALYTICAL TECHNIQUES, AND FIELDS OF TESTING ISSUED CONCURRENTLY WITH THIS CERTIFICATE AND REVISED AS NECESSARY.

ACCREDITED STATUS DEPENDS ON SUCCESSFUL ONGOING PARTICIPATION IN THE PROGRAM AND CONTINUED COMPLIANCE WITH THE STANDARDS.

CUSTOMERS ARE URGED TO VERIFY THE LABORATORY'S CURRENT ACCREDITATION STATUS IN OREGON.

Gary K. Ward, MS

Oregon State Public Health Laboratory

ORELAP Administrator

3150 NW. 229th Ave, Suite 100

Hillsboro, OR 97124

ISSUE DATE: 05/12/2015

EXPIRATION DATE: 05/11/2016

Certificate No: WA100006 - 007

Oregon

Environmental Laboratory Accreditation Program

Department of Agriculture, Laboratory Division
Department of Environmental Quality, Laboratory Division
Oregon Health Authority, Public Health Division

NELAP Recognized

ORELAP Fields of Accreditation

ORELAP ID: WA100006
EPA CODE: WA00037
Certificate: WA100006 - 008

Analytical Resources Inc.

4611 S. 134th Place, Suite 100
Tukwila WA 98168-3240

Issue Date: 05/12/2015 ***Expiration Date:*** 05/11/2016

As of 05/12/2015 ***this list supercedes all previous lists for this certificate number.***
Customers. Please verify the current accreditation standing with ORELAP.

MATRIX : Biological Tissue

Reference	Code	Description
EPA 1613B	**10120602**	**Tetra- through Octa-Chlorinated Dioxins and Furans by Isotope Dilution GC/HRMS**

Analyte Code	*Analyte*
9516	1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)
9519	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)
9420	1,2,3,4,6,7,8-Heptachlorodibenzofuran (1,2,3,4,6,7,8-hpcdf)
9426	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (1,2,3,4,6,7,8-hpcdd)
9423	1,2,3,4,7,8,9-Heptachlorodibenzofuran (1,2,3,4,7,8,9-hpcdf)
9471	1,2,3,4,7,8-Hexachlorodibenzofuran (1,2,3,4,7,8-Hxcdf)
9453	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (1,2,3,4,7,8-Hxcdd)
9474	1,2,3,6,7,8-Hexachlorodibenzofuran (1,2,3,6,7,8-Hxcdf)
9456	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin(1,2,3,6,7,8-Hxcdd)
9477	1,2,3,7,8,9-Hexachlorodibenzofuran (1,2,3,7,8,9-Hxcdf)
9459	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (1,2,3,7,8,9-Hxcdd)
9543	1,2,3,7,8-Pentachlorodibenzofuran (1,2,3,7,8-Pecdf)
9540	1,2,3,7,8-Pentachlorodibenzo-p-dioxin (1,2,3,7,8-Pecdd)
9480	2,3,4,6,7,8-Hexachlorodibenzofuran
9549	2,3,4,7,8-Pentachlorodibenzofuran
9618	2,3,7,8-Tetrachlorodibenzo- p-dioxin (2,3,7,8-TCDD)
9612	2,3,7,8-Tetrachlorodibenzofuran
9438	Hpcdd, total
9444	Hpcdf, total
9468	Hxcdd, total
9483	Hxcdf, total
9555	Pecdd, total
9552	Pecdf, total
9609	TCDD, total
9615	TCDF, total

EPA 200.7 5	**10014003**	**ICP - metals**

Analyte Code	*Analyte*
1000	Aluminum
1005	Antimony
1010	Arsenic
1015	Barium
1020	Beryllium
1025	Boron
1030	Cadmium
1035	Calcium
1040	Chromium
1050	Cobalt

ORELAP Fields of Accreditation

ORELAP ID: WA100006
EPA CODE: WA00037
Certificate: WA100006 - 008

Analytical Resources Inc.

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Analyte Code	*Analyte*
1055	Copper
1070	Iron
1075	Lead
1085	Magnesium
1090	Manganese
1100	Molybdenum
1105	Nickel
1125	Potassium
1140	Selenium
1145	Silicon
1150	Silver
1155	Sodium
1160	Strontium
1165	Thallium
1175	Tin
1180	Titanium
1185	Vanadium
1190	Zinc

EPA 200.8 5.5 **10014809** **Metals by ICP-MS**

Analyte Code	*Analyte*
1000	Aluminum
1005	Antimony
1010	Arsenic
1015	Barium
1020	Beryllium
1030	Cadmium
1035	Calcium
1040	Chromium
1050	Cobalt
1055	Copper
1070	Iron
1075	Lead
1085	Magnesium
1090	Manganese
1100	Molybdenum
1105	Nickel
1125	Potassium
1140	Selenium
1150	Silver
1155	Sodium
1165	Thallium
1185	Vanadium
1190	Zinc

EPA 245.5 **10037602** **Mercury in Sediment by Cold Vapor Atomic Absorption**

Analyte Code	*Analyte*
1095	Mercury

EPA 3050B **10135601** **Acid Digestion of Sediments, Sludges, and soils**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 3540C **10140202** **Soxhlet Extraction**

Analyte Code	*Analyte*
8031	Extraction/Preparation

ORELAP Fields of Accreditation

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EPA 3550C **10142004** **Ultrasonic Extraction**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 3580A **10143007** **Waste Dilution**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 3640A **10147203** **Gel Preparation Cleanup**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 3660B **10148400** **Sulfur cleanup**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 5000 **10152600** **Sample Preparation for Volatile Organics**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 5035 **10154004** **Closed-System Purge-and-Trap and Extraction for Volatile Organics in Soil and Waste Samples**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 6010C **10155803** **ICP - AES**

Analyte Code	*Analyte*
1000	Aluminum
1005	Antimony
1010	Arsenic
1015	Barium
1020	Beryllium
1025	Boron
1030	Cadmium
1035	Calcium
1040	Chromium
1050	Cobalt
1055	Copper
1070	Iron
1075	Lead
1085	Magnesium
1090	Manganese
1100	Molybdenum
1105	Nickel
1125	Potassium
1140	Selenium
1145	Silicon
1150	Silver
1155	Sodium
1160	Strontium
1165	Thallium
1175	Tin
1180	Titanium
1185	Vanadium
1190	Zinc

ORELAP Fields of Accreditation

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EPA 6020A **10156408** **Inductively Coupled Plasma-Mass Spectrometry**

Analyte Code	*Analyte*
1000	Aluminum
1005	Antimony
1010	Arsenic
1015	Barium
1020	Beryllium
1030	Cadmium
1035	Calcium
1040	Chromium
1050	Cobalt
1055	Copper
1070	Iron
1075	Lead
1085	Magnesium
1090	Manganese
1100	Molybdenum
1105	Nickel
1125	Potassium
1140	Selenium
1150	Silver
1155	Sodium
1165	Thallium
1185	Vanadium
1190	Zinc

EPA 7471B **10166402** **Mercury by Cold Vapor Atomic Absorption**

Analyte Code	*Analyte*
1095	Mercury

EPA 8081B **10178800** **Organochlorine Pesticides by GC/ECD**

Analyte Code	*Analyte*
8580	2,4'-DDD
8585	2,4'-DDE
8590	2,4'-DDT
7355	4,4'-DDD
7360	4,4'-DDE
7365	4,4'-DDT
7025	Aldrin
7110	alpha-BHC (alpha-Hexachlorocyclohexane)
7240	alpha-Chlordane
7115	beta-BHC (beta-Hexachlorocyclohexane)
7250	Chlordane (tech.)
7925	cis-Nonachlor
7105	delta-BHC
7470	Dieldrin
7510	Endosulfan I
7515	Endosulfan II
7520	Endosulfan sulfate
7540	Endrin
7530	Endrin aldehyde
7535	Endrin ketone
7120	gamma-BHC (Lindane, gamma-HexachlorocyclohexanE)
7245	gamma-Chlordane
7685	Heptachlor
7690	Heptachlor epoxide
6275	Hexachlorobenzene
4835	Hexachlorobutadiene

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Analyte Code	*Analyte*
7810	Methoxychlor
7870	Mirex
3890	Oxychlordane
8250	Toxaphene (Chlorinated camphene)
7910	trans-Nanochlor

EPA 8082A **10179201** **Polychlorinated Biphenyls (PCBs) by GC/ECD**

Analyte Code	*Analyte*
9902	2,2',3,3',4,4',5,5',6-Nonabromodiphenyl ether (BDE-206)
9890	2,2',3,3',4,4',5,5'-Octabromodiphenyl ether (BDE-194)
9090	2,2',3,3',4,4',5,5'-Octachlorobiphenyl (BZ-194)
9903	2,2',3,3',4,4',5,6,6'-Nonabromodiphenyl ether (BDE-207)
9891	2,2',3,3',4,4',5,6-Octabromodiphenyl ether (BDE-195)
9892	2,2',3,3',4,4',5,6'-Octabromodiphenyl ether (BDE-196)
9103	2,2',3,3',4,4',5,6-Octachlorobiphenyl (BZ-195)
9866	2,2',3,3',4,4',5-Heptabromodiphenyl ether (BDE-170)
9065	2,2',3,3',4,4',5-Heptachlorobiphenyl (BZ-170)
9020	2,2',3,3',4,4'-Hexachlorobiphenyl (BZ-128)
9112	2,2',3,3',4,5',6,6'-Octachlorobiphenyl (BZ-201)
9873	2,2',3,3',4',5,6-Heptabromodiphenyl ether (BDE-177)
9116	2,2',3,3',4,5,6'-Heptachlorobiphenyl (BZ-174)
9114	2,2',3,3',4,5',6'-Heptachlorobiphenyl (BZ-177)
9120	2,2',3,3',4,6'-Hexachlorobiphenyl (BZ-132)
9133	2,2',3,4,4',5,5',6-Octachlorobiphenyl (BZ-203)
9134	2,2',3,4,4',5,5'-Heptachlorobiphenyl (BZ-180)
9878	2,2',3,4,4',5,6'-Heptabromodiphenyl ether (BDE-182)
9075	2,2',3,4,4',5',6-Heptachlorobiphenyl (BZ-183)
9835	2,2',3,4,4',5'-Hexabromodiphenyl ether (BDE-138)
9025	2,2',3,4,4',5'-Hexachlorobiphenyl (BZ-138)
9784	2,2',3,4,4'-Pentabromodiphenyl ether (BDE-85)
9080	2,2',3,4',5,5',6-Heptachlorobiphenyl (BZ-187)
9030	2,2',3,4,5,5'-Hexachlorobiphenyl (BZ-141)
9151	2,2',3,4',5',6-Hexachlorobiphenyl (BZ-149)
9796	2,2',3',4,5-Pentabromodiphenyl ether (BDE-97)
8975	2,2',3,4,5'-Pentachlorobiphenyl (BZ-87)
9154	2,2',3,4',5'-Pentachlorobiphenyl (BZ-97)
9797	2,2',3',4,6-Pentabromodiphenyl ether (BDE-98)
9035	2,2',3,5,5',6-Hexachlorobiphenyl (BZ-151)
9166	2,2',3,5',6-Pentachlorobiphenyl (BZ-95)
8945	2,2',3,5'-Tetrachlorobiphenyl (BZ-44)
9569	2,2',4,4',5,5'-Hexabromodiphenyl ether (BDE-153)
9040	2,2',4,4',5,5'-Hexachlorobiphenyl (BZ-153)
9850	2,2',4,4',5',6-Hexabromodiphenyl ether (BDE-154)
9571	2,2',4,4',5-Pentabromodiphenyl ether (BDE-99)
9175	2,2',4,4',5-Pentachlorobiphenyl (BZ-99)
9572	2,2',4,4',6-Pentabromodiphenyl ether (BDE-100)
9773	2,2',4,4'-Tetrabromodiphenyl ether (BDE-47)
8980	2,2',4,5,5'-Pentachlorobiphenyl (BZ-101)
8950	2,2',4,5'-Tetrachlorobiphenyl (BZ-49)
9716	2,2',4-Tribromodiphenyl ether (BDE-17)
8955	2,2',5,5'-Tetrachlorobiphenyl (BZ-52)
8930	2,2',5-Trichlorobiphenyl (BZ-18)
9050	2,3,3',4,4',5-Hexachlorobiphenyl (BZ-156)
9193	2,3,3',4,4',6-Hexachlorobiphenyl (BZ-158)
8985	2,3,3',4,4'-Pentachlorobiphenyl (BZ-105)
9819	2',3,3',4,5-Pentabromodiphenyl ether (BDE-122)
8990	2,3,3',4',6-Pentachlorobiphenyl (BZ-110)
9207	2,3,3',4'-Tetrachlorobiphenyl (BZ-56)
9820	2',3,4,4',5-Pentabromodiphenyl ether (BDE-123)
8995	2,3',4,4',5-Pentachlorobiphenyl (BZ-118)

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Analyte Code	*Analyte*
9758	2,3,4,4'-Tetrabromodiphenyl ether (BDE-60)
9764	2,3',4,4'-Tetrabromodiphenyl ether (BDE-66)
9221	2,3,4,4'-Tetrachlorobiphenyl (BZ-60)
8960	2,3',4,4'-Tetrachlorobiphenyl (BZ-66)
9821	2',3,4,5,5'-Pentabromodiphenyl ether (BDE-124)
9822	2',3,4,5,6'-Pentabromodiphenyl ether (BDE-125)
9775	2',3,4,5-Tetrabromodiphenyl ether (BDE-76)
9230	2,3',4',5-Tetrachlorobiphenyl (BZ-70)
9760	2,3,4,6-Tetrabromodiphenyl ether (BDE-62)
9769	2,3',4',6-Tetrabromodiphenyl ether (BDE-71)
9732	2',3,4-Tribromodiphenyl ether (BDE-33)
9239	2,3',4'-Trichlorobiphenyl (BZ-33)
9733	2',3,5-Tribromodiphenyl ether (BDE-34)
9250	2,4,4',5-Tetrachlorobiphenyl (BZ-74)
9727	2,4,4'-Tribromodiphenyl ether (BDE-28)
9252	2,4,4'-Trichlorobiphenyl (BZ-28)
8940	2,4',5-Trichlorobiphenyl (BZ-31)
9256	2,4'-Dichlorobiphenyl (BZ-8)
8880	Aroclor-1016 (PCB-1016)
8885	Aroclor-1221 (PCB-1221)
8890	Aroclor-1232 (PCB-1232)
8895	Aroclor-1242 (PCB-1242)
8900	Aroclor-1248 (PCB-1248)
8905	Aroclor-1254 (PCB-1254)
8910	Aroclor-1260 (PCB-1260)
8912	Aroclor-1262 (PCB-1262)
8913	Aroclor-1268 (PCB-1268)

EPA 8260C **10307003** **Volatile Organics: GC/MS (capillary column)**

Analyte Code	*Analyte*
5105	1,1,1,2-Tetrachloroethane
5160	1,1,1-Trichloroethane
5110	1,1,2,2-Tetrachloroethane
5195	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)
5165	1,1,2-Trichloroethane
4630	1,1-Dichloroethane
4640	1,1-Dichloroethylene
4670	1,1-Dichloropropene
5150	1,2,3-Trichlorobenzene
5180	1,2,3-Trichloropropane
5155	1,2,4-Trichlorobenzene
5210	1,2,4-Trimethylbenzene
4570	1,2-Dibromo-3-chloropropane (DBCP)
4585	1,2-Dibromoethane (EDB, Ethylene dibromide)
4610	1,2-Dichlorobenzene
4635	1,2-Dichloroethane (Ethylene dichloride)
4655	1,2-Dichloropropane
5215	1,3,5-Trimethylbenzene
4615	1,3-Dichlorobenzene
4660	1,3-Dichloropropane
4620	1,4-Dichlorobenzene
4665	2,2-Dichloropropane
4410	2-Butanone (Methyl ethyl ketone, MEK)
4500	2-Chloroethyl vinyl ether
4535	2-Chlorotoluene
4860	2-Hexanone
4540	4-Chlorotoluene
4910	4-Isopropyltoluene (p-Cymene)
4995	4-Methyl-2-pentanone (MIBK)
4315	Acetone

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Analyte Code	*Analyte*
4325	Acrolein (Propenal)
4340	Acrylonitrile
4375	Benzene
4385	Bromobenzene
4390	Bromochloromethane
4395	Bromodichloromethane
4397	Bromoethane (Ethyl Bromide)
4400	Bromoform
4450	Carbon disulfide
4455	Carbon tetrachloride
4475	Chlorobenzene
4575	Chlorodibromomethane
4485	Chloroethane (Ethyl chloride)
4505	Chloroform
4645	cis-1,2-Dichloroethylene
4680	cis-1,3-Dichloropropene
4595	Dibromomethane (Methylene bromide)
4625	Dichlorodifluoromethane (Freon-12)
4765	Ethylbenzene
4835	Hexachlorobutadiene
4870	Iodomethane (Methyl iodide)
4900	Isopropylbenzene
5240	m+p-xylene
4950	Methyl bromide (Bromomethane)
4960	Methyl chloride (Chloromethane)
5000	Methyl tert-butyl ether (MTBE)
4975	Methylene chloride (Dichloromethane)
5005	Naphthalene
4435	n-Butylbenzene
5090	n-Propylbenzene
5250	o-Xylene
4440	sec-Butylbenzene
5100	Styrene
4445	tert-Butylbenzene
5115	Tetrachloroethylene (Perchloroethylene)
5140	Toluene
4700	trans-1,2-Dichloroethylene
4685	trans-1,3-Dichloropropylene
4605	trans-1,4-Dichloro-2-butene
5170	Trichloroethene (Trichloroethylene)
5175	Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)
5225	Vinyl acetate
5235	Vinyl chloride

EPA 8270D **10186002** **Semivolatile Organic compounds by GC/MS**

Analyte Code	*Analyte*
6715	1,2,4,5-Tetrachlorobenzene
5155	1,2,4-Trichlorobenzene
4610	1,2-Dichlorobenzene
4615	1,3-Dichlorobenzene
4620	1,4-Dichlorobenzene
4735	1,4-Dioxane (1,4- Diethyleneoxide)
6380	1-Methylnaphthalene
4659	2,2'-Oxybis(1-chloropropane)
6835	2,4,5-Trichlorophenol
6840	2,4,6-Trichlorophenol
6000	2,4-Dichlorophenol
6130	2,4-Dimethylphenol
6175	2,4-Dinitrophenol
6185	2,4-Dinitrotoluene (2,4-DNT)

ORELAP Fields of Accreditation

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Analyte Code	Analyte
6190	2,6-Dinitrotoluene (2,6-DNT)
5795	2-Chloronaphthalene
5800	2-Chlorophenol
6360	2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)
6385	2-Methylnaphthalene
6400	2-Methylphenol (o-Cresol)
6460	2-Nitroaniline
6490	2-Nitrophenol
5945	3,3'-Dichlorobenzidine
6465	3-Nitroaniline
5660	4-Bromophenyl phenyl ether
5700	4-Chloro-3-methylphenol
5745	4-Chloroaniline
5825	4-Chlorophenyl phenylether
4910	4-Isopropyltoluene (p-Cymene)
6410	4-Methylphenol (p-Cresol)
6470	4-Nitroaniline
6500	4-Nitrophenol
5500	Acenaphthene
5505	Acenaphthylene
5510	Acetophenone
7005	Alachlor
6700	alpha-Terpineol
5545	Aniline
5555	Anthracene
7075	Azinphos-methyl (Guthion)
5562	Azobenzene
5595	Benzidine
5575	Benzo(a)anthracene
5580	Benzo(a)pyrene
5605	Benzo(e)pyrene
5590	Benzo(g,h,i)perylene
5600	Benzo(k)fluoranthene
5585	Benzo[b]fluoranthene
5610	Benzoic acid
5630	Benzyl alcohol
5640	Biphenyl
5760	bis(2-Chloroethoxy)methane
5765	bis(2-Chloroethyl) ether
7125	Bolstar (Sulprofos)
5670	Butyl benzyl phthalate
5671	Butyl diphenyl Phosphate
5673	Butylated Hydroxy Toluene (BHT)
5680	Carbazole
7255	Chlorfenvinphos
7300	Chlorpyrifos
5855	Chrysene
7315	Coumaphos
7330	Crotoxyphos
7385	Demeton-s
6065	Di(2-ethylhexyl) phthalate (bis(2-Ethylhexyl)phthalate, DEHP)
7410	Diazinon
5895	Dibenz(a,h) anthracene
5905	Dibenzofuran
5912	Dibutyl phenyl Phospahate
7465	Dicrotophos
6070	Diethyl phthalate
7475	Dimethoate
6135	Dimethyl phthalate
5925	Di-n-butyl phthalate
6200	Di-n-octyl phthalate

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Analyte Code	*Analyte*
8625	Disulfoton
7550	EPN
7565	Ethion
7570	Ethoprop
7600	Fensulfothion
7605	Fenthion
6265	Fluoranthene
6270	Fluorene
6275	Hexachlorobenzene
4835	Hexachlorobutadiene
6285	Hexachlorocyclopentadiene
4840	Hexachloroethane
6315	Indeno(1,2,3-cd) pyrene
6320	Isophorone
7770	Malathion
7785	Merphos
7825	Methyl parathion (Parathion, methyl)
7850	Mevinphos
7880	Monocrotophos
7905	Naled
5005	Naphthalene
5015	Nitrobenzene
6530	n-Nitrosodimethylamine
6545	n-Nitrosodi-n-propylamine
6535	n-Nitrosodiphenylamine
7955	Parathion, ethyl
6605	Pentachlorophenol
6615	Phenanthrene
6625	Phenol
7985	Phorate
6665	Pyrene
5095	Pyridine
6683	Retene
8110	Ronnel
8155	Sulfotepp
8200	Tetrachlorvinphos (Stirophos, Gardona) Z-isomer
8245	Tokuthion (Prothiophos)
8262	Tributyl phosphate
8275	Trichloronate
8282	Triphenyl phosphate

EPA 8270D SIM **10242509** **Semivolatile Organic compounds by GC/MS Selective Ion Monitoring**

Analyte Code	*Analyte*
6380	1-Methylnaphthalene
6385	2-Methylnaphthalene
5500	Acenaphthene
5505	Acenaphthylene
5555	Anthracene
5575	Benzo(a)anthracene
5580	Benzo(a)pyrene
5605	Benzo(e)pyrene
5590	Benzo(g,h,i)perylene
9309	Benzo(j)fluoranthene
5600	Benzo(k)fluoranthene
5585	Benzo[b]fluoranthene
5640	Biphenyl
5680	Carbazole
5855	Chrysene
5895	Dibenz(a,h) anthracene
5905	Dibenzofuran

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Analyte Code	*Analyte*
6265	Fluoranthene
6270	Fluorene
6315	Indeno(1,2,3-cd) pyrene
5005	Naphthalene
6608	Perylene
6615	Phenanthrene
6665	Pyrene

EPA 8290A **10187403** **Polychlorinated Dibenzodioxins (PCDDs) and Polychlorinated Dibenzofurans (PCDFs) by GC/HRMS**

Analyte Code	*Analyte*
9516	1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)
9519	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)
9420	1,2,3,4,6,7,8-Heptachlorodibenzofuran (1,2,3,4,6,7,8-hpcdf)
9426	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (1,2,3,4,6,7,8-hpcdd)
9423	1,2,3,4,7,8,9-Heptachlorodibenzofuran (1,2,3,4,7,8,9-hpcdf)
9471	1,2,3,4,7,8-Hexachlorodibenzofuran (1,2,3,4,7,8-Hxcdf)
9453	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (1,2,3,4,7,8-Hxcdd)
9474	1,2,3,6,7,8-Hexachlorodibenzofuran (1,2,3,6,7,8-Hxcdf)
9456	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin(1,2,3,6,7,8-Hxcdd)
9477	1,2,3,7,8,9-Hexachlorodibenzofuran (1,2,3,7,8,9-Hxcdf)
9459	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (1,2,3,7,8,9-Hxcdd)
9543	1,2,3,7,8-Pentachlorodibenzofuran (1,2,3,7,8-Pecdf)
9540	1,2,3,7,8-Pentachlorodibenzo-p-dioxin (1,2,3,7,8-Pecdd)
9480	2,3,4,6,7,8-Hexachlorodibenzofuran
9549	2,3,4,7,8-Pentachlorodibenzofuran
9618	2,3,7,8-Tetrachlorodibenzo- p-dioxin (2,3,7,8-TCDD)
9612	2,3,7,8-Tetrachlorodibenzofuran
9438	Hpcdd, total
9444	Hpcdf, total
9468	Hxcdd, total
9483	Hxcdf, total
9555	Pecdd, total
9552	Pecdf, total
9609	TCDD, total
9615	TCDF, total

ORELAP Fields of Accreditation

ORELAP ID: WA100006
EPA CODE: WA00037
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Analytical Resources Inc.

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MATRIX : Non-Potable Water

Reference	Code	Description
AK101 GRO	**90015002**	**Determination of Gasoline Range Organics - Alaska Department of Environmental Conservation**

Analyte Code	*Analyte*
9408	Gasoline range organics (GRO)

AK102 DRO	**90015206**	**Determination of Diesel Range Organics - Alaska Department of Environmental Conservation**

Analyte Code	*Analyte*
9369	Diesel range organics (DRO)

AK103 RRO	**90015400**	**Determination of Residual Range Organics - Alaska Department of Environmental Conservation**

Analyte Code	*Analyte*
9499	Motor Oil

EPA 120.1	**10006209**	**Conductance - Specific @ 25 C**

Analyte Code	*Analyte*
1610	Conductivity

EPA 1311	**10118806**	**Toxicity Characteristic Leaching Procedure**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 1312	**10119003**	**Synthetic Precipitation Leaching Procedure**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 160.4	**10010409**	**Total Volatile Solids, ignition @ 550 C.**

Analyte Code	*Analyte*
1970	Residue-volatile

EPA 1613B	**10120602**	**Tetra- through Octa-Chlorinated Dioxins and Furans by Isotope Dilution GC/HRMS**

Analyte Code	*Analyte*
9516	1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)
9519	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)
9420	1,2,3,4,6,7,8-Heptachlorodibenzofuran (1,2,3,4,6,7,8-hpcdf)
9426	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (1,2,3,4,6,7,8-hpcdd)
9423	1,2,3,4,7,8,9-Heptachlorodibenzofuran (1,2,3,4,7,8,9-hpcdf)
9471	1,2,3,4,7,8-Hexachlorodibenzofuran (1,2,3,4,7,8-Hxcdf)
9453	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (1,2,3,4,7,8-Hxcdd)
9474	1,2,3,6,7,8-Hexachlorodibenzofuran (1,2,3,6,7,8-Hxcdf)
9456	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin(1,2,3,6,7,8-Hxcdd)
9477	1,2,3,7,8,9-Hexachlorodibenzofuran (1,2,3,7,8,9-Hxcdf)
9459	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (1,2,3,7,8,9-Hxcdd)
9543	1,2,3,7,8-Pentachlorodibenzofuran (1,2,3,7,8-Pecdf)
9540	1,2,3,7,8-Pentachlorodibenzo-p-dioxin (1,2,3,7,8-Pecdd)
9480	2,3,4,6,7,8-Hexachlorodibenzofuran
9549	2,3,4,7,8-Pentachlorodibenzofuran
9618	2,3,7,8-Tetrachlorodibenzo- p-dioxin (2,3,7,8-TCDD)
9612	2,3,7,8-Tetrachlorodibenzofuran
9438	Hpcdd, total
9444	Hpcdf, total

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Analyte Code	Analyte
9468	Hxcdd, total
9483	Hxcdf, total
9555	Pecdd, total
9552	Pecdf, total
9609	TCDD, total
9615	TCDF, total

EPA 1664A (HEM) **10127807** **N-Hexane Extractable Material (Oil and Grease) by Extraction and Gravimetry**

Analyte Code	Analyte
1803	n-Hexane Extractable Material (O&G)

EPA 1664A (SGT-HEM) **10261606** **Silica Gen Treated N-Hexane Extractable Material (Oil and Grease)**

Analyte Code	Analyte
1803	n-Hexane Extractable Material (O&G)

EPA 180.1 2 **10011800** **Turbidity - Nephelometric**

Analyte Code	Analyte
2055	Turbidity

EPA 200.7 5 **10014003** **ICP - metals**

Analyte Code	Analyte
1000	Aluminum
1005	Antimony
1010	Arsenic
1015	Barium
1020	Beryllium
1025	Boron
1030	Cadmium
1035	Calcium
1040	Chromium
1050	Cobalt
1055	Copper
1070	Iron
1075	Lead
1085	Magnesium
1090	Manganese
1100	Molybdenum
1105	Nickel
1125	Potassium
1140	Selenium
1145	Silicon
1150	Silver
1155	Sodium
1160	Strontium
1165	Thallium
1175	Tin
1180	Titanium
1185	Vanadium
1190	Zinc

EPA 200.8 5.5 10014809 Metals by ICP-MS

Analyte Code	Analyte
1000	Aluminum
1005	Antimony
1010	Arsenic

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Analyte Code	*Analyte*
1015	Barium
1020	Beryllium
1030	Cadmium
1035	Calcium
1040	Chromium
1050	Cobalt
1055	Copper
1070	Iron
1075	Lead
1085	Magnesium
1090	Manganese
1100	Molybdenum
1105	Nickel
1125	Potassium
1140	Selenium
1150	Silver
1155	Sodium
1165	Thallium
1185	Vanadium
1190	Zinc

EPA 245.1 4.1 **10271008** **Mercury by Cold Vapor Atomic Absorption**

Analyte Code	*Analyte*
1095	Mercury

EPA 300.0 2.1 **10053200** **Methods for the Determination of Inorganic Substances in Environmental Samples**

Analyte Code	*Analyte*
1540	Bromide
1575	Chloride
1730	Fluoride
1810	Nitrate as N
1840	Nitrite as N
1870	Orthophosphate as P
2000	Sulfate

EPA 3005A **10133207** **Acid Digestion of waters for Total Recoverable or Dissolved Metals**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 3010A **10133605** **Acid Digestion of Aqueous samples and Extracts for Total Metals**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 3020A **10134404** **Acid Digestion of Aqueous samples and Extracts for Total Metals for Analysis by GFAA**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 351.2 2 **10065404** **Total Kjeldahl Nitrogen - Block Digest, Phenate**

Analyte Code	*Analyte*
1790	Kjeldahl nitrogen
1795	Kjeldahl nitrogen - total

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EPA 3510C **10138202** **Separatory Funnel Liquid-liquid extraction**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 3520C **10139001** **Continuous Liquid-liquid extraction**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 353.2 2 **10067604** **Nitrate/Nitrite Nitrogen - Automated, Cadmium**

Analyte Code	*Analyte*
1810	Nitrate as N
1820	Nitrate-nitrite
1840	Nitrite as N

EPA 3550C **10142004** **Ultrasonic Extraction**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 3580A **10143007** **Waste Dilution**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 3611B **10145207** **Alumina Column Cleanup and separation of petroleum wastes**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 3620C **10146006** **Florisil Cleanup**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 3630C **10146802** **Silica gel cleanup**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 3640A **10147203** **Gel Preparation Cleanup**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 3650B **10147805** **Acid base partition cleanup**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 3660B **10148400** **Sulfur cleanup**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 3665A **10148808** **Sulfuric Acid / permanganate Cleanup**

Analyte Code	*Analyte*

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Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 375.2 2 **10073004** **Sulfate - Colorimetric, Automated, Methylthymol.**

Analyte Code	*Analyte*
2000	Sulfate

EPA 410.4 2 **10077404** **Chemical Oxygen Demand - Colorimetric, Automated.**

Analyte Code	*Analyte*
1565	Chemical oxygen demand

EPA 420.1 **10079400** **Phenolics - Spectrophotometric, manual.**

Analyte Code	*Analyte*
1905	Total phenolics

EPA 5000 **10152600** **Sample Preparation for Volatile Organics**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 5030B **10153409** **Purge and trap for aqueous samples**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 6010C **10155803** **ICP - AES**

Analyte Code	*Analyte*
1000	Aluminum
1005	Antimony
1010	Arsenic
1015	Barium
1020	Beryllium
1025	Boron
1030	Cadmium
1035	Calcium
1040	Chromium
1050	Cobalt
1055	Copper
1070	Iron
1075	Lead
1085	Magnesium
1090	Manganese
1100	Molybdenum
1105	Nickel
1125	Potassium
1140	Selenium
1145	Silicon
1150	Silver
1155	Sodium
1165	Thallium
1175	Tin
1180	Titanium
1185	Vanadium
1190	Zinc

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EPA 6020A **10156408** **Inductively Coupled Plasma-Mass Spectrometry**

Analyte Code	*Analyte*
1000	Aluminum
1005	Antimony
1010	Arsenic
1015	Barium
1020	Beryllium
1030	Cadmium
1035	Calcium
1040	Chromium
1050	Cobalt
1055	Copper
1070	Iron
1075	Lead
1085	Magnesium
1090	Manganese
1100	Molybdenum
1105	Nickel
1125	Potassium
1140	Selenium
1150	Silver
1155	Sodium
1165	Thallium
1185	Vanadium
1190	Zinc

EPA 7196A **10162400** **Chromium Hexavalent colorimetric**

Analyte Code	*Analyte*
1045	Chromium VI

EPA 7470A **10165807** **Mercury in Liquid Waste by Cold Vapor Atomic Absorption**

Analyte Code	*Analyte*
1095	Mercury

EPA 8021B **10174808** **Aromatic and Halogenated Volatiles by GC with PID and/or ECD Purge & Trap**

Analyte Code	*Analyte*
4375	Benzene
4765	Ethylbenzene
5240	m+p-xylene
5000	Methyl tert-butyl ether (MTBE)
5250	o-Xylene
5140	Toluene

EPA 8081B **10178800** **Organochlorine Pesticides by GC/ECD**

Analyte Code	*Analyte*
8580	2,4'-DDD
8585	2,4'-DDE
8590	2,4'-DDT
7355	4,4'-DDD
7360	4,4'-DDE
7365	4,4'-DDT
7025	Aldrin
7110	alpha-BHC (alpha-Hexachlorocyclohexane)
7240	alpha-Chlordane
7115	beta-BHC (beta-Hexachlorocyclohexane)
7250	Chlordane (tech.)

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Analyte Code	*Analyte*
7925	cis-Nonachlor
7105	delta-BHC
7470	Dieldrin
7510	Endosulfan I
7515	Endosulfan II
7520	Endosulfan sulfate
7540	Endrin
7530	Endrin aldehyde
7535	Endrin ketone
7120	gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)
7245	gamma-Chlordane
7685	Heptachlor
7690	Heptachlor epoxide
6275	Hexachlorobenzene
4835	Hexachlorobutadiene
7810	Methoxychlor
7870	Mirex
3890	Oxychlordane
8250	Toxaphene (Chlorinated camphene)
7910	trans-Nanochlor

EPA 8082A **10179201** **Polychlorinated Biphenyls (PCBs) by GC/ECD**

Analyte Code	*Analyte*
9902	2,2',3,3',4,4',5,5',6-Nonabromodiphenyl ether (BDE-206)
9890	2,2',3,3',4,4',5,5'-Octabromodiphenyl ether (BDE-194)
9090	2,2',3,3',4,4',5,5'-Octachlorobiphenyl (BZ-194)
9903	2,2',3,3',4,4',5,6,6'-Nonabromodiphenyl ether (BDE-207)
9891	2,2',3,3',4,4',5,6-Octabromodiphenyl ether (BDE-195)
9892	2,2',3,3',4,4',5,6'-Octabromodiphenyl ether (BDE-196)
9103	2,2',3,3',4,4',5,6-Octachlorobiphenyl (BZ-195)
9866	2,2',3,3',4,4',5-Heptabromodiphenyl ether (BDE-170)
9065	2,2',3,3',4,4',5-Heptachlorobiphenyl (BZ-170)
9020	2,2',3,3',4,4'-Hexachlorobiphenyl (BZ-128)
9112	2,2',3,3',4,5',6,6'-Octachlorobiphenyl (BZ-201)
9873	2,2',3,3',4',5,6-Heptabromodiphenyl ether (BDE-177)
9116	2,2',3,3',4,5,6'-Heptachlorobiphenyl (BZ-174)
9114	2,2',3,3',4,5',6-Heptachlorobiphenyl (BZ-177)
9120	2,2',3,3',4,6'-Hexachlorobiphenyl (BZ-132)
9133	2,2',3,4,4',5,5',6-Octachlorobiphenyl (BZ-203)
9134	2,2',3,4,4',5,5'-Heptachlorobiphenyl (BZ-180)
9878	2,2',3,4,4',5,6'-Heptabromodiphenyl ether (BDE-182)
9075	2,2',3,4,4',5',6-Heptachlorobiphenyl (BZ-183)
9835	2,2',3,4,4',5'-Hexabromodiphenyl ether (BDE-138)
9025	2,2',3,4,4',5'-Hexachlorobiphenyl (BZ-138)
9784	2,2',3,4,4'-Pentabromodiphenyl ether (BDE-85)
9080	2,2',3,4',5,5',6-Heptachlorobiphenyl (BZ-187)
9030	2,2',3,4,5,5'-Hexachlorobiphenyl (BZ-141)
9151	2,2',3,4',5',6-Hexachlorobiphenyl (BZ-149)
9796	2,2',3',4,5-Pentabromodiphenyl ether (BDE-97)
8975	2,2',3,4,5'-Pentachlorobiphenyl (BZ-87)
9154	2,2',3,4',5'-Pentachlorobiphenyl (BZ-97)
9797	2,2',3',4,6-Pentabromodiphenyl ether (BDE-98)
9035	2,2',3,5,5',6-Hexachlorobiphenyl (BZ-151)
9166	2,2',3,5',6-Pentachlorobiphenyl (BZ-95)
8945	2,2',3,5'-Tetrachlorobiphenyl (BZ-44)
9569	2,2',4,4',5,5'-Hexabromodiphenyl ether (BDE-153)
9040	2,2',4,4',5,5'-Hexachlorobiphenyl (BZ-153)
9850	2,2',4,4',5',6-Hexabromodiphenyl ether (BDE-154)
9571	2,2',4,4',5-Pentabromodiphenyl ether (BDE-99)
9175	2,2',4,4',5-Pentachlorobiphenyl (BZ-99)

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Analyte Code	*Analyte*
9572	2,2',4,4',6-Pentabromodiphenyl ether (BDE-100)
9773	2,2',4,4'-Tetrabromodiphenyl ether (BDE-47)
8980	2,2',4,5,5'-Pentachlorobiphenyl (BZ-101)
8950	2,2',4,5'-Tetrachlorobiphenyl (BZ-49)
9716	2,2',4-Tribromodiphenyl ether (BDE-17)
8955	2,2',5,5'-Tetrachlorobiphenyl (BZ-52)
8930	2,2',5-Trichlorobiphenyl (BZ-18)
9050	2,3,3',4,4',5-Hexachlorobiphenyl (BZ-156)
9193	2,3,3',4,4',6-Hexachlorobiphenyl (BZ-158)
8985	2,3,3',4,4'-Pentachlorobiphenyl (BZ-105)
9819	2',3,3',4,5-Pentabromodiphenyl ether (BDE-122)
8990	2,3,3',4',6-Pentachlorobiphenyl (BZ-110)
9207	2,3,3',4'-Tetrachlorobiphenyl (BZ-56)
9820	2',3,4,4',5-Pentabromodiphenyl ether (BDE-123)
8995	2,3',4,4',5-Pentachlorobiphenyl (BZ-118)
9758	2,3,4,4'-Tetrabromodiphenyl ether (BDE-60)
9764	2,3',4,4'-Tetrabromodiphenyl ether (BDE-66)
9221	2,3,4,4'-Tetrachlorobiphenyl (BZ-60)
8960	2,3',4,4'-Tetrachlorobiphenyl (BZ-66)
9821	2',3,4,5,5'-Pentabromodiphenyl ether (BDE-124)
9822	2',3,4,5,6'-Pentabromodiphenyl ether (BDE-125)
9775	2',3,4,5-Tetrabromodiphenyl ether (BDE-76)
9230	2,3',4',5-Tetrachlorobiphenyl (BZ-70)
9760	2,3,4,6-Tetrabromodiphenyl ether (BDE-62)
9769	2,3',4',6-Tetrabromodiphenyl ether (BDE-71)
9732	2',3,4-Tribromodiphenyl ether (BDE-33)
9239	2,3',4'-Trichlorobiphenyl (BZ-33)
9733	2',3,5-Tribromodiphenyl ether (BDE-34)
9250	2,4,4',5-Tetrachlorobiphenyl (BZ-74)
9727	2,4,4'-Tribromodiphenyl ether (BDE-28)
9252	2,4,4'-Trichlorobiphenyl (BZ-28)
8940	2,4',5-Trichlorobiphenyl (BZ-31)
9256	2,4'-Dichlorobiphenyl (BZ-8)
8880	Aroclor-1016 (PCB-1016)
8885	Aroclor-1221 (PCB-1221)
8890	Aroclor-1232 (PCB-1232)
8895	Aroclor-1242 (PCB-1242)
8900	Aroclor-1248 (PCB-1248)
8905	Aroclor-1254 (PCB-1254)
8910	Aroclor-1260 (PCB-1260)
8912	Aroclor-1262 (PCB-1262)
8913	Aroclor-1268 (PCB-1268)

EPA 8260C **10307003** **Volatile Organics: GC/MS (capillary column)**

Analyte Code	*Analyte*
5105	1,1,1,2-Tetrachloroethane
5160	1,1,1-Trichloroethane
5110	1,1,2,2-Tetrachloroethane
5195	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)
5165	1,1,2-Trichloroethane
4630	1,1-Dichloroethane
4640	1,1-Dichloroethylene
4670	1,1-Dichloropropene
5150	1,2,3-Trichlorobenzene
5180	1,2,3-Trichloropropane
5155	1,2,4-Trichlorobenzene
5210	1,2,4-Trimethylbenzene
4570	1,2-Dibromo-3-chloropropane (DBCP)
4585	1,2-Dibromoethane (EDB, Ethylene dibromide)
4610	1,2-Dichlorobenzene

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Analyte Code	Analyte
4635	1,2-Dichloroethane (Ethylene dichloride)
4655	1,2-Dichloropropane
5215	1,3,5-Trimethylbenzene
4615	1,3-Dichlorobenzene
4660	1,3-Dichloropropane
4620	1,4-Dichlorobenzene
4665	2,2-Dichloropropane
4410	2-Butanone (Methyl ethyl ketone, MEK)
4500	2-Chloroethyl vinyl ether
4535	2-Chlorotoluene
4860	2-Hexanone
4540	4-Chlorotoluene
4910	4-Isopropyltoluene (p-Cymene)
4995	4-Methyl-2-pentanone (MIBK)
4315	Acetone
4325	Acrolein (Propenal)
4340	Acrylonitrile
4375	Benzene
4385	Bromobenzene
4390	Bromochloromethane
4395	Bromodichloromethane
4397	Bromoethane (Ethyl Bromide)
4400	Bromoform
4450	Carbon disulfide
4455	Carbon tetrachloride
4475	Chlorobenzene
4575	Chlorodibromomethane
4485	Chloroethane (Ethyl chloride)
4505	Chloroform
4645	cis-1,2-Dichloroethylene
4680	cis-1,3-Dichloropropene
4560	Cyclohexanone
4595	Dibromomethane (Methylene bromide)
4625	Dichlorodifluoromethane (Freon-12)
4725	Diethyl ether
9375	Di-isopropylether (DIPE)
4765	Ethylbenzene
4770	Ethyl-t-butylether (ETBE) (2-Ethoxy-2-methylpropane)
4835	Hexachlorobutadiene
4870	Iodomethane (Methyl iodide)
4900	Isopropylbenzene
5240	m+p-xylene
4950	Methyl bromide (Bromomethane)
4960	Methyl chloride (Chloromethane)
5000	Methyl tert-butyl ether (MTBE)
4975	Methylene chloride (Dichloromethane)
5005	Naphthalene
4435	n-Butylbenzene
5090	n-Propylbenzene
5250	o-Xylene
4440	sec-Butylbenzene
5100	Styrene
4370	T-amylmethylether (TAME)
4420	tert-Butyl alcohol
4445	tert-Butylbenzene
5115	Tetrachloroethylene (Perchloroethylene)
5140	Toluene
4700	trans-1,2-Dichloroethylene
4685	trans-1,3-Dichloropropylene
4605	trans-1,4-Dichloro-2-butene
5170	Trichloroethene (Trichloroethylene)

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Analyte Code	*Analyte*
5175	Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)
5225	Vinyl acetate
5235	Vinyl chloride

EPA 8260C SIM **10307105** **Volatile Organic Compounds by GC/MS-SIM**

Analyte Code	*Analyte*
5105	1,1,1,2-Tetrachloroethane
4640	1,1-Dichloroethylene
4635	1,2-Dichloroethane (Ethylene dichloride)
4340	Acrylonitrile
4375	Benzene
4645	cis-1,2-Dichloroethylene
5115	Tetrachloroethylene (Perchloroethylene)
4700	trans-1,2-Dichloroethylene
5170	Trichloroethene (Trichloroethylene)
5235	Vinyl chloride

EPA 8270D **10186002** **Semivolatile Organic compounds by GC/MS**

Analyte Code	*Analyte*
6715	1,2,4,5-Tetrachlorobenzene
5155	1,2,4-Trichlorobenzene
4610	1,2-Dichlorobenzene
4615	1,3-Dichlorobenzene
4620	1,4-Dichlorobenzene
4735	1,4-Dioxane (1,4- Diethyleneoxide)
6380	1-Methylnaphthalene
4659	2,2'-Oxybis(1-chloropropane)
6835	2,4,5-Trichlorophenol
6840	2,4,6-Trichlorophenol
6000	2,4-Dichlorophenol
6130	2,4-Dimethylphenol
6175	2,4-Dinitrophenol
6185	2,4-Dinitrotoluene (2,4-DNT)
6190	2,6-Dinitrotoluene (2,6-DNT)
5795	2-Chloronaphthalene
5800	2-Chlorophenol
6360	2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)
6385	2-Methylnaphthalene
6400	2-Methylphenol (o-Cresol)
6460	2-Nitroaniline
6490	2-Nitrophenol
5945	3,3'-Dichlorobenzidine
6465	3-Nitroaniline
5660	4-Bromophenyl phenyl ether
5700	4-Chloro-3-methylphenol
5745	4-Chloroaniline
5825	4-Chlorophenyl phenylether
4910	4-Isopropyltoluene (p-Cymene)
6410	4-Methylphenol (p-Cresol)
6470	4-Nitroaniline
6500	4-Nitrophenol
5500	Acenaphthene
5505	Acenaphthylene
5510	Acetophenone
7005	Alachlor
6700	alpha-Terpineol
5545	Aniline
5555	Anthracene
7075	Azinphos-methyl (Guthion)

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Analyte Code	*Analyte*
5562	Azobenzene
5595	Benzidine
5575	Benzo(a)anthracene
5580	Benzo(a)pyrene
5605	Benzo(e)pyrene
5590	Benzo(g,h,i)perylene
5600	Benzo(k)fluoranthene
5585	Benzo[b]fluoranthene
5610	Benzoic acid
5630	Benzyl alcohol
5640	Biphenyl
5760	bis(2-Chloroethoxy)methane
5765	bis(2-Chloroethyl) ether
7125	Bolstar (Sulprofos)
5670	Butyl benzyl phthalate
5671	Butyl diphenyl Phosphate
5673	Butylated Hydroxy Toluene (BHT)
5680	Carbazole
7255	Chlorfenvinphos
7300	Chlorpyrifos
5855	Chrysene
7315	Coumaphos
7330	Crotoxyphos
7385	Demeton-s
6065	Di(2-ethylhexyl) phthalate (bis(2-Ethylhexyl)phthalate, DEHP)
7410	Diazinon
5895	Dibenz(a,h) anthracene
5905	Dibenzofuran
5912	Dibutyl phenyl Phospahate
7465	Dicrotophos
6070	Diethyl phthalate
7475	Dimethoate
6135	Dimethyl phthalate
5925	Di-n-butyl phthalate
6200	Di-n-octyl phthalate
8625	Disulfoton
7550	EPN
7565	Ethion
7570	Ethoprop
7600	Fensulfothion
7605	Fenthion
6265	Fluoranthene
6270	Fluorene
6275	Hexachlorobenzene
4835	Hexachlorobutadiene
6285	Hexachlorocyclopentadiene
4840	Hexachloroethane
6315	Indeno(1,2,3-cd) pyrene
6320	Isophorone
7770	Malathion
7785	Merphos
7825	Methyl parathion (Parathion, methyl)
7850	Mevinphos
7880	Monocrotophos
7905	Naled
5005	Naphthalene
5015	Nitrobenzene
6530	n-Nitrosodimethylamine
6545	n-Nitrosodi-n-propylamine
6535	n-Nitrosodiphenylamine
7955	Parathion, ethyl

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Analyte Code	*Analyte*
6605	Pentachlorophenol
6615	Phenanthrene
6625	Phenol
7985	Phorate
6665	Pyrene
5095	Pyridine
6683	Retene
8110	Ronnel
8155	Sulfotepp
8200	Tetrachlorvinphos (Stirophos, Gardona) Z-isomer
8245	Tokuthion (Prothiophos)
8262	Tributyl phosphate
8275	Trichloronate
8282	Triphenyl phosphate

EPA 8270D SIM **10242509** **Semivolatile Organic compounds by GC/MS Selective Ion Monitoring**

Analyte Code	*Analyte*
6380	1-Methylnaphthalene
6385	2-Methylnaphthalene
5500	Acenaphthene
5505	Acenaphthylene
5555	Anthracene
5575	Benzo(a)anthracene
5580	Benzo(a)pyrene
5605	Benzo(e)pyrene
5590	Benzo(g,h,i)perylene
9309	Benzo(j)fluoranthene
5600	Benzo(k)fluoranthene
5585	Benzo[b]fluoranthene
5640	Biphenyl
1201	Butyltin trichloride
5680	Carbazole
5855	Chrysene
5895	Dibenz(a,h) anthracene
5905	Dibenzofuran
5913	Dibutyltin
1202	Dibutyltin dichloride
6265	Fluoranthene
6270	Fluorene
6315	Indeno(1,2,3-cd) pyrene
1206	Monobutyltin
5005	Naphthalene
6608	Perylene
6615	Phenanthrene
6665	Pyrene
1209	Tetrabutyltin
1213	Tributyltin
1203	Tributyltin chloride

EPA 8290A **10187403** **Polychlorinated Dibenzodioxins (PCDDs) and Polychlorinated Dibenzofurans (PCDFs) by GC/HRMS**

Analyte Code	*Analyte*
9516	1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)
9519	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)
9420	1,2,3,4,6,7,8-Heptachlorodibenzofuran (1,2,3,4,6,7,8-hpcdf)
9426	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (1,2,3,4,6,7,8-hpcdd)
9423	1,2,3,4,7,8,9-Heptachlorodibenzofuran (1,2,3,4,7,8,9-hpcdf)
9471	1,2,3,4,7,8-Hexachlorodibenzofuran (1,2,3,4,7,8-Hxcdf)
9453	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (1,2,3,4,7,8-Hxcdd)
9474	1,2,3,6,7,8-Hexachlorodibenzofuran (1,2,3,6,7,8-Hxcdf)

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Analyte Code	*Analyte*
9456	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin(1,2,3,6,7,8-Hxcdd)
9477	1,2,3,7,8,9-Hexachlorodibenzofuran (1,2,3,7,8,9-Hxcdf)
9459	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (1,2,3,7,8,9-Hxcdd)
9543	1,2,3,7,8-Pentachlorodibenzofuran (1,2,3,7,8-Pecdf)
9540	1,2,3,7,8-Pentachlorodibenzo-p-dioxin (1,2,3,7,8-Pecdd)
9480	2,3,4,6,7,8-Hexachlorodibenzofuran
9549	2,3,4,7,8-Pentachlorodibenzofuran
9618	2,3,7,8-Tetrachlorodibenzo- p-dioxin (2,3,7,8-TCDD)
9612	2,3,7,8-Tetrachlorodibenzofuran
9438	Hpcdd, total
9444	Hpcdf, total
9468	Hxcdd, total
9483	Hxcdf, total
9555	Pecdd, total
9552	Pecdf, total
9609	TCDD, total
9615	TCDF, total

EPA 9010C **10243002** **Total and Amenable Cyanide by Distillation and UV-Vis**

Analyte Code	*Analyte*
1510	Amenable cyanide
1645	Total cyanide

EPA 9014 **10193803** **Titrimetric and Manual Spectrophotometric Determinative Methods for Cyanide**

Analyte Code	*Analyte*
1510	Amenable cyanide
1635	Cyanide
1645	Total cyanide

EPA 9030B **10195605** **Acid-Soluble and Acid-Insoluble sulfides: Distillation**

Analyte Code	*Analyte*
2005	Sulfide

EPA 9034 **10196006** **Titrimetric Procedure for Acid-Soluble and Acid-Insoluble Sulfides**

Analyte Code	*Analyte*
2005	Sulfide

EPA 9036 **10196404** **Sulfate (Colorimetric, Automated, Methylthymol Blue, AA II)**

Analyte Code	*Analyte*
2000	Sulfate

EPA 9040C **10244403** **pH Electrometric Measurement**

Analyte Code	*Analyte*
1900	pH

EPA 9050A **10198808** **Specific Conductance**

Analyte Code	*Analyte*
1610	Conductivity

EPA 9056A **10199607** **Determination of Inorganic Anions by Ion Chromatography**

Analyte Code	*Analyte*
1540	Bromide

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Analyte Code	*Analyte*
1575	Chloride
1730	Fluoride
1810	Nitrate as N
1840	Nitrite as N
1870	Orthophosphate as P
2000	Sulfate

EPA 9060A **10244801** **Total Organic Carbon**

Analyte Code	*Analyte*
2040	Total organic carbon

EPA 9065 **10200405** **Phenolics (Spectrophotometric, Manual 4-AAP with Distillation)**

Analyte Code	*Analyte*
1905	Total phenolics

EPA 9214 **10206403** **Potentiometric Determination of Fluoride in Aqueous Samples with Ion-Selective Electrode**

Analyte Code	*Analyte*
1730	Fluoride

EPA 9251 **10207406** **Chloride (Colorimetric, Automated Ferricyanide AAII)**

Analyte Code	*Analyte*
1575	Chloride

EPA RSK-175 (GC-FID) **10212905** **Methane, Ethane, and Ethene in water by Headspace GC/FID**

Analyte Code	*Analyte*
4323	Acetylene
4747	Ethane
4752	Ethene
4926	Methane
5029	n-Propane

NWTPH-Dx **90018409** **Oregon DEQ TPH Diesel Range**

Analyte Code	*Analyte*
9369	Diesel range organics (DRO)
9488	Jet Fuel
2050	Total Petroleum Hydrocarbons (TPH)

NWTPH-Gx **90018603** **Oregon DEQ TPH Gasoline Range Organics by GC/FID-PID Purge & Trap**

Analyte Code	*Analyte*
9408	Gasoline range organics (GRO)

NWTPH-HCID **90013200** **Oregon DEQ Total Petroleum Hydrocarbon ID**

Analyte Code	*Analyte*
2050	Total Petroleum Hydrocarbons (TPH)

Puget Sound Estuary Program (PSEP): Conventional Sediment Variables 60006408 PSEP: Organotins, TOC, and Sulfide

Analyte Code	*Analyte*
1201	Butyltin trichloride
5913	Dibutyltin
1202	Dibutyltin dichloride
1206	Monobutyltin

ORELAP Fields of Accreditation

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Analyte Code	*Analyte*
1209	Tetrabutyltin
1213	Tributyltin
1203	Tributyltin chloride

SM 2120 B-2001 online **20039309** **Color by Visual Comparison**

Analyte Code	*Analyte*
1605	Color

SM 2130 B-94 online **20042802** **Turbidity by Nephelometric Method**

Analyte Code	*Analyte*
2055	Turbidity

SM 2320 B-97 online **20045607** **Alkalinity by Titration Method**

Analyte Code	*Analyte*
1505	Alkalinity as CaCO3

SM 2340 B-97 online **20046600** **Hardness by calculation**

Analyte Code	*Analyte*
1750	Hardness

SM 2510 B-97 online **20048606** **Conductivity by Probe**

Analyte Code	*Analyte*
1610	Conductivity

SM 2520 B 20th ED **20040055** **Salinity by Electrical Conductivity**

Analyte Code	*Analyte*
1975	Salinity

SM 2540 B-97 online **20049405** **Total Solids Dried at 103 - 105C**

Analyte Code	*Analyte*
1950	Residue-total

SM 2540 C-97 online **20050402** **Total Dissolved Solids Dried at 180C**

Analyte Code	*Analyte*
1955	Residue-filterable (TDS)

SM 2540 D-97 online **20051201** **Total Suspended Solids Dried at 103 - 105C**

Analyte Code	*Analyte*
1960	Residue-nonfilterable (TSS)

SM 2540 E-1997 **20051585** **Fixed & Volatile Solids Ignited at 550 C**

Analyte Code	*Analyte*
1947	Residue - Fixed
1970	Residue-volatile
1725	Total, fixed, and volatile residue

SM 2540 F-97 online **20052204** **Settleable Solids**

Analyte Code	*Analyte*
1965	Residue-settleable

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SM 2540 G-1997 **20005269** **Total, Fixed, and Volatile Solids in Solid and Semisolid Samples**

Analyte Code	*Analyte*
1725	Total, fixed, and volatile residue

SM 2580 B 20th ED **20054051** **Oxidation-Reduction Potential Measurement in Clean Water**

Analyte Code	*Analyte*
1871	O-R Potential

SM 3500-Cr B-2009 online **20066255** **Chromium by Colorimetric Method**

Analyte Code	*Analyte*
1045	Chromium VI

SM 3500-Fe B-97 online **20069005** **Iron by Phenanthroline Method**

Analyte Code	*Analyte*
1070	Iron

SM 4110 B-2000 **20076908** **Anions by Ion Chromatography**

Analyte Code	*Analyte*
1540	Bromide
1575	Chloride
1730	Fluoride
1810	Nitrate as N
1840	Nitrite as N
1870	Orthophosphate as P
2000	Sulfate

SM 4500-Cl⁻ E-97 online **20086800** **Chloride by Automated Ferricyanide Method**

Analyte Code	*Analyte*
1575	Chloride

SM 4500-CN C-1999 **20095652** **Cyanide (Total) after Distillation**

Analyte Code	*Analyte*
1635	Cyanide

SM 4500-CN E-1999 **20096417** **Cyanide by Colorimetric Method**

Analyte Code	*Analyte*
1635	Cyanide
1645	Total cyanide

SM 4500-CN G-1999 online **20097216** **Cyanide Amenable to Chlorination after Distillation**

Analyte Code	*Analyte*
1510	Amenable cyanide

SM 4500-CN⁻ C-97 online **20095607** **Cyanide by Total Cyanide after Distillation**

Analyte Code	*Analyte*
1635	Cyanide
1645	Total cyanide

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SM 4500-CN⁻ I-97 online **20098004** **Cyanide by Weak Acid Dissociable Cyanide**

Analyte Code	*Analyte*
2074	Weak Acid Dissociable Cyanide

SM 4500-F⁻ C-97 online **20102403** **Fluoride by Ion-Selective Electrode Method**

Analyte Code	*Analyte*
1730	Fluoride

SM 4500-H+ B-2000 online **20105219** **pH Value by Electrometric Method .**

Analyte Code	*Analyte*
1900	pH

SM 4500-NH3 D-97 online **20109404** **Ammonia by Ammonia-Selective Electrode Method .**

Analyte Code	*Analyte*
1515	Ammonia as N

SM 4500-NH3 H-97 online **20112203** **Ammonia by Flow Injection Analysis**

Analyte Code	*Analyte*
1515	Ammonia as N

SM 4500-NO3 I-2000 **20118552** **Nitrate by Cadmium Reduction Flow Injection**

Analyte Code	*Analyte*
1805	Nitrate
1820	Nitrate-nitrite
1835	Nitrite

SM 4500-Norg D 21st ED **20120267** **Nitrogen (Organic) by Block Digestion and Flow Injection Analysis**

Analyte Code	*Analyte*
1790	Kjeldahl nitrogen
1795	Kjeldahl nitrogen - total

SM 4500-P B 21st ED **20122809** **Phosphorus by Sample Preparation**

Analyte Code	*Analyte*
1910	Phosphorus, total

SM 4500-P E-1999 **20124214** **Phosphorous by Ascorbic Acid Method**

Analyte Code	*Analyte*
1870	Orthophosphate as P
1910	Phosphorus, total
1908	Total Phosphate

SM 4500-S2 D-2000 **20125853** **Sulfide by Methylene Blue Method**

Analyte Code	*Analyte*
2005	Sulfide

SM 4500-S2⁻ F-2000 online **20126652** **Sulfide by Iodometric Method**

Analyte Code	*Analyte*
2005	Sulfide

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SM 4500-SO3$^{=}$B-2000 online **20130625** **Sulfite by Iodometric Method**

Analyte Code	*Analyte*
2015	Sulfite-SO3

SM 4500-SO4$^{=}$G-97 online **20134401** **Sulfate by Methylthymol Blue Flow Injection Analysis (20th Edition)**

Analyte Code	*Analyte*
2000	Sulfate

SM 5210 B-2001 online **20135255** **Biochemical Oxygen Demand (BOD), 5-Day**

Analyte Code	*Analyte*
1530	Biochemical oxygen demand
1555	Carbonaceous BOD, CBOD

SM 5220 D-97 online **20136805** **COD by Closed Reflux, Colorimetric Method**

Analyte Code	*Analyte*
1565	Chemical oxygen demand

SM 5310 B-2000 **20137819** **Total Organic Carbon (TOC) by Combustion Infra-red Method**

Analyte Code	*Analyte*
1710	Dissolved organic carbon (DOC)
2040	Total organic carbon

SM 5520 F-05 online **20143208** **Oil and Grease by Hydrocarbons**

Analyte Code	*Analyte*
1803	n-Hexane Extractable Material (O&G)
1860	Oil & Grease

SM 5520 G-05 online **20143606** **Oil and Grease by Solid-Phase, Partition-Gravimetric Method**

Analyte Code	*Analyte*
1803	n-Hexane Extractable Material (O&G)
1860	Oil & Grease

SM 5530 D-2005 **20143764** **Phenols by Direct Photometric Method**

Analyte Code	*Analyte*
1905	Total phenolics

WA EPH **60015001** **Extractable Petroleum Hydrocarbons**

Analyte Code	*Analyte*
6211	EPH Aliphatic >C10-C12
6212	EPH Aliphatic >C12-C16
6214	EPH Aliphatic >C16-C21
6216	EPH Aliphatic >C21-C34
6220	EPH Aliphatic C8-C10
6222	EPH Aliphatic C9-C18
6224	EPH Aromatic >C10-C12
6226	EPH Aromatic >C12-C16
6228	EPH Aromatic >C16-C21
6236	EPH Aromatic C8-C10

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WA VPH **60015056** **Volatile Petroleum Hydrocarbons (VPH) by GC/PID Purge & Trap**

Analyte Code	*Analyte*
5300	VPH Aliphatic >C10-C12
5301	VPH Aliphatic >C6-C8
5302	VPH Aliphatic >C8-C10
5303	VPH Aliphatic C5-C6
5308	VPH Aromatic >C10-C12
5309	VPH Aromatic >C12-C13
5310	VPH Aromatic >C8-C10

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MATRIX : Solids

Reference	Code	Description
AK101 GRO	**90015002**	**Determination of Gasoline Range Organics - Alaska Department of Environmental Conservation**

Analyte Code	*Analyte*
9408	Gasoline range organics (GRO)

Reference	Code	Description
AK102 DRO	**90015206**	**Determination of Diesel Range Organics - Alaska Department of Environmental Conservation**

Analyte Code	*Analyte*
9369	Diesel range organics (DRO)

Reference	Code	Description
AK103 RRO	**90015400**	**Determination of Residual Range Organics - Alaska Department of Environmental Conservation**

Analyte Code	*Analyte*
9499	Motor Oil

Reference	Code	Description
EPA 1311	**10118806**	**Toxicity Characteristic Leaching Procedure**

Analyte Code	*Analyte*
8031	Extraction/Preparation

Reference	Code	Description
EPA 1312	**10119003**	**Synthetic Precipitation Leaching Procedure**

Analyte Code	*Analyte*
8031	Extraction/Preparation

Reference	Code	Description
EPA 1613B	**10120602**	**Tetra- through Octa-Chlorinated Dioxins and Furans by Isotope Dilution GC/HRMS**

Analyte Code	*Analyte*
9516	1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)
9519	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)
9420	1,2,3,4,6,7,8-Heptachlorodibenzofuran (1,2,3,4,6,7,8-hpcdf)
9426	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (1,2,3,4,6,7,8-hpcdd)
9423	1,2,3,4,7,8,9-Heptachlorodibenzofuran (1,2,3,4,7,8,9-hpcdf)
9471	1,2,3,4,7,8-Hexachlorodibenzofuran (1,2,3,4,7,8-Hxcdf)
9453	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (1,2,3,4,7,8-Hxcdd)
9474	1,2,3,6,7,8-Hexachlorodibenzofuran (1,2,3,6,7,8-Hxcdf)
9456	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin(1,2,3,6,7,8-Hxcdd)
9477	1,2,3,7,8,9-Hexachlorodibenzofuran (1,2,3,7,8,9-Hxcdf)
9459	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (1,2,3,7,8,9-Hxcdd)
9543	1,2,3,7,8-Pentachlorodibenzofuran (1,2,3,7,8-Pecdf)
9540	1,2,3,7,8-Pentachlorodibenzo-p-dioxin (1,2,3,7,8-Pecdd)
9480	2,3,4,6,7,8-Hexachlorodibenzofuran
9549	2,3,4,7,8-Pentachlorodibenzofuran
9618	2,3,7,8-Tetrachlorodibenzo- p-dioxin (2,3,7,8-TCDD)
9612	2,3,7,8-Tetrachlorodibenzofuran
9438	Hpcdd, total
9444	Hpcdf, total
9468	Hxcdd, total
9483	Hxcdf, total
9555	Pecdd, total
9552	Pecdf, total
9609	TCDD, total
9615	TCDF, total

Reference	Code	Description
EPA 200.7 5	**10014003**	**ICP - metals**

Analyte Code	*Analyte*

ORELAP Fields of Accreditation

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Analyte Code	*Analyte*
1000	Aluminum
1005	Antimony
1010	Arsenic
1015	Barium
1020	Beryllium
1025	Boron
1030	Cadmium
1035	Calcium
1040	Chromium
1050	Cobalt
1055	Copper
1070	Iron
1075	Lead
1085	Magnesium
1090	Manganese
1100	Molybdenum
1105	Nickel
1125	Potassium
1140	Selenium
1145	Silicon
1150	Silver
1155	Sodium
1160	Strontium
1165	Thallium
1175	Tin
1180	Titanium
1185	Vanadium
1190	Zinc

EPA 200.8 5.5 **10014809** **Metals by ICP-MS**

Analyte Code	*Analyte*
1000	Aluminum
1005	Antimony
1010	Arsenic
1015	Barium
1020	Beryllium
1030	Cadmium
1035	Calcium
1040	Chromium
1050	Cobalt
1055	Copper
1070	Iron
1075	Lead
1085	Magnesium
1090	Manganese
1100	Molybdenum
1105	Nickel
1125	Potassium
1140	Selenium
1150	Silver
1155	Sodium
1165	Thallium
1185	Vanadium
1190	Zinc

EPA 245.5 **10037602** **Mercury in Sediment by Cold Vapor Atomic Absorption**

Analyte Code	*Analyte*
1095	Mercury

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EPA 300.0 2.1 **10053200** **Methods for the Determination of Inorganic Substances in Environmental Samples**

Analyte Code	*Analyte*
1540	Bromide
1575	Chloride
1730	Fluoride
1810	Nitrate as N
1840	Nitrite as N
1870	Orthophosphate as P
2000	Sulfate

EPA 3050B **10135601** **Acid Digestion of Sediments, Sludges, and soils**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 3060A **10136604** **Alkaline Digestion for Hexavalent Chromium**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 351.2 2 **10065404** **Total Kjeldahl Nitrogen - Block Digest, Phenate**

Analyte Code	*Analyte*
1790	Kjeldahl nitrogen
1795	Kjeldahl nitrogen - total

EPA 353.2 2 **10067604** **Nitrate/Nitrite Nitrogen - Automated, Cadmium**

Analyte Code	*Analyte*
1810	Nitrate as N
1820	Nitrate-nitrite
1840	Nitrite as N

EPA 3540C **10140202** **Soxhlet Extraction**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 3546 **10141205** **Microwave Extraction**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 3550C **10142004** **Ultrasonic Extraction**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 3580A **10143007** **Waste Dilution**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 3611B 10145207 Alumina Column Cleanup and separation of petroleum wastes

Analyte Code	*Analyte*
8031	Extraction/Preparation

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EPA 3620C **10146006** **Florisil Cleanup**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 3630C **10146802** **Silica gel cleanup**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 3640A **10147203** **Gel Preparation Cleanup**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 3650B **10147805** **Acid base partition cleanup**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 3660B **10148400** **Sulfur cleanup**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 3665A **10148808** **Sulfuric Acid / permanganate Cleanup**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 420.1 **10079400** **Phenolics - Spectrophotometric, manual.**

Analyte Code	*Analyte*
1905	Total phenolics

EPA 5000 **10152600** **Sample Preparation for Volatile Organics**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 5035 **10154004** **Closed-System Purge-and-Trap and Extraction for Volatile Organics in Soil and Waste Samples**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 6010C **10155803** **ICP - AES**

Analyte Code	*Analyte*
1000	Aluminum
1005	Antimony
1010	Arsenic
1015	Barium
1020	Beryllium
1025	Boron
1030	Cadmium
1035	Calcium
1040	Chromium
1050	Cobalt
1055	Copper
1070	Iron
1075	Lead

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Analyte Code	*Analyte*
1085	Magnesium
1090	Manganese
1100	Molybdenum
1105	Nickel
1125	Potassium
1140	Selenium
1145	Silicon
1150	Silver
1155	Sodium
1160	Strontium
1165	Thallium
1175	Tin
1180	Titanium
1185	Vanadium
1190	Zinc

EPA 6020A **10156408** **Inductively Coupled Plasma-Mass Spectrometry**

Analyte Code	*Analyte*
1000	Aluminum
1005	Antimony
1010	Arsenic
1015	Barium
1020	Beryllium
1030	Cadmium
1035	Calcium
1040	Chromium
1050	Cobalt
1055	Copper
1070	Iron
1075	Lead
1085	Magnesium
1090	Manganese
1100	Molybdenum
1105	Nickel
1125	Potassium
1140	Selenium
1150	Silver
1155	Sodium
1165	Thallium
1185	Vanadium
1190	Zinc

EPA 7196A **10162400** **Chromium Hexavalent colorimetric**

Analyte Code	*Analyte*
1045	Chromium VI

EPA 7471B **10166402** **Mercury by Cold Vapor Atomic Absorption**

Analyte Code	*Analyte*
1095	Mercury

EPA 8021B **10174808** **Aromatic and Halogenated Volatiles by GC with PID and/or ECD Purge & Trap**

Analyte Code	*Analyte*
4375	Benzene
4765	Ethylbenzene
5240	m+p-xylene
5000	Methyl tert-butyl ether (MTBE)

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Analyte Code	*Analyte*
5250	o-Xylene
5140	Toluene

EPA 8081B **10178800** **Organochlorine Pesticides by GC/ECD**

Analyte Code	*Analyte*
8580	2,4'-DDD
8585	2,4'-DDE
8590	2,4'-DDT
7355	4,4'-DDD
7360	4,4'-DDE
7365	4,4'-DDT
7025	Aldrin
7110	alpha-BHC (alpha-Hexachlorocyclohexane)
7240	alpha-Chlordane
7115	beta-BHC (beta-Hexachlorocyclohexane)
7250	Chlordane (tech.)
7925	cis-Nonachlor
7105	delta-BHC
7470	Dieldrin
7510	Endosulfan I
7515	Endosulfan II
7520	Endosulfan sulfate
7540	Endrin
7530	Endrin aldehyde
7535	Endrin ketone
7120	gamma-BHC (Lindane, gamma-HexachlorocyclohexanE)
7245	gamma-Chlordane
7685	Heptachlor
7690	Heptachlor epoxide
6275	Hexachlorobenzene
4835	Hexachlorobutadiene
7810	Methoxychlor
7870	Mirex
3890	Oxychlordane
8250	Toxaphene (Chlorinated camphene)
7910	trans-Nanochlor

EPA 8082A **10179201** **Polychlorinated Biphenyls (PCBs) by GC/ECD**

Analyte Code	*Analyte*
9902	2,2',3,3',4,4',5,5',6-Nonabromodiphenyl ether (BDE-206)
9890	2,2',3,3',4,4',5,5'-Octabromodiphenyl ether (BDE-194)
9090	2,2',3,3',4,4',5,5'-Octachlorobiphenyl (BZ-194)
9903	2,2',3,3',4,4',5,6,6'-Nonabromodiphenyl ether (BDE-207)
9891	2,2',3,3',4,4',5,6-Octabromodiphenyl ether (BDE-195)
9892	2,2',3,3',4,4',5,6'-Octabromodiphenyl ether (BDE-196)
9103	2,2',3,3',4,4',5,6-Octachlorobiphenyl (BZ-195)
9866	2,2',3,3',4,4',5-Heptabromodiphenyl ether (BDE-170)
9065	2,2',3,3',4,4',5-Heptachlorobiphenyl (BZ-170)
9020	2,2',3,3',4,4'-Hexachlorobiphenyl (BZ-128)
9112	2,2',3,3',4,5',6,6'-Octachlorobiphenyl (BZ-201)
9873	2,2',3,3',4',5,6-Heptabromodiphenyl ether (BDE-177)
9116	2,2',3,3',4,5,6'-Heptachlorobiphenyl (BZ-174)
9114	2,2',3,3',4,5',6'-Heptachlorobiphenyl (BZ-177)
9120	2,2',3,3',4,6'-Hexachlorobiphenyl (BZ-132)
9133	2,2',3,4,4',5,5',6-Octachlorobiphenyl (BZ-203)
9134	2,2',3,4,4',5,5'-Heptachlorobiphenyl (BZ-180)
9878	2,2',3,4,4',5,6'-Heptabromodiphenyl ether (BDE-182)
9075	2,2',3,4,4',5',6-Heptachlorobiphenyl (BZ-183)
9835	2,2',3,4,4',5'-Hexabromodiphenyl ether (BDE-138)

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Analyte Code	Analyte
9025	2,2',3,4,4',5'-Hexachlorobiphenyl (BZ-138)
9784	2,2',3,4,4'-Pentabromodiphenyl ether (BDE-85)
9080	2,2',3,4',5,5',6-Heptachlorobiphenyl (BZ-187)
9030	2,2',3,4,5,5'-Hexachlorobiphenyl (BZ-141)
9151	2,2',3,4',5',6-Hexachlorobiphenyl (BZ-149)
9796	2,2',3',4,5-Pentabromodiphenyl ether (BDE-97)
8975	2,2',3,4,5'-Pentachlorobiphenyl (BZ-87)
9154	2,2',3,4',5'-Pentachlorobiphenyl (BZ-97)
9797	2,2',3',4,6-Pentabromodiphenyl ether (BDE-98)
9035	2,2',3,5,5',6-Hexachlorobiphenyl (BZ-151)
9166	2,2',3,5',6-Pentachlorobiphenyl (BZ-95)
8945	2,2',3,5'-Tetrachlorobiphenyl (BZ-44)
9569	2,2',4,4',5,5'-Hexabromodiphenyl ether (BDE-153)
9040	2,2',4,4',5,5'-Hexachlorobiphenyl (BZ-153)
9850	2,2',4,4',5',6-Hexabromodiphenyl ether (BDE-154)
9571	2,2',4,4',5-Pentabromodiphenyl ether (BDE-99)
9175	2,2',4,4',5-Pentachlorobiphenyl (BZ-99)
9572	2,2',4,4',6-Pentabromodiphenyl ether (BDE-100)
9773	2,2',4,4'-Tetrabromodiphenyl ether (BDE-47)
8980	2,2',4,5,5'-Pentachlorobiphenyl (BZ-101)
8950	2,2',4,5'-Tetrachlorobiphenyl (BZ-49)
9716	2,2',4-Tribromodiphenyl ether (BDE-17)
8955	2,2',5,5'-Tetrachlorobiphenyl (BZ-52)
8930	2,2',5-Trichlorobiphenyl (BZ-18)
9050	2,3,3',4,4',5-Hexachlorobiphenyl (BZ-156)
9193	2,3,3',4,4',6-Hexachlorobiphenyl (BZ-158)
8985	2,3,3',4,4'-Pentachlorobiphenyl (BZ-105)
9819	2',3,3',4,5-Pentabromodiphenyl ether (BDE-122)
8990	2,3,3',4',6-Pentachlorobiphenyl (BZ-110)
9207	2,3,3',4'-Tetrachlorobiphenyl (BZ-56)
9820	2',3,4,4',5-Pentabromodiphenyl ether (BDE-123)
8995	2,3',4,4',5-Pentachlorobiphenyl (BZ-118)
9758	2,3,4,4'-Tetrabromodiphenyl ether (BDE-60)
9764	2,3',4,4'-Tetrabromodiphenyl ether (BDE-66)
9221	2,3,4,4'-Tetrachlorobiphenyl (BZ-60)
8960	2,3',4,4'-Tetrachlorobiphenyl (BZ-66)
9821	2',3,4,5,5'-Pentabromodiphenyl ether (BDE-124)
9822	2',3,4,5,6'-Pentabromodiphenyl ether (BDE-125)
9775	2',3,4,5-Tetrabromodiphenyl ether (BDE-76)
9230	2,3',4',5-Tetrachlorobiphenyl (BZ-70)
9760	2,3,4,6-Tetrabromodiphenyl ether (BDE-62)
9769	2,3',4',6-Tetrabromodiphenyl ether (BDE-71)
9732	2',3,4-Tribromodiphenyl ether (BDE-33)
9239	2,3',4'-Trichlorobiphenyl (BZ-33)
9733	2',3,5-Tribromodiphenyl ether (BDE-34)
9250	2,4,4',5-Tetrachlorobiphenyl (BZ-74)
9727	2,4,4'-Tribromodiphenyl ether (BDE-28)
9252	2,4,4'-Trichlorobiphenyl (BZ-28)
8940	2,4',5-Trichlorobiphenyl (BZ-31)
9256	2,4'-Dichlorobiphenyl (BZ-8)
8880	Aroclor-1016 (PCB-1016)
8885	Aroclor-1221 (PCB-1221)
8890	Aroclor-1232 (PCB-1232)
8895	Aroclor-1242 (PCB-1242)
8900	Aroclor-1248 (PCB-1248)
8905	Aroclor-1254 (PCB-1254)
8910	Aroclor-1260 (PCB-1260)
8912	Aroclor-1262 (PCB-1262)
8913	Aroclor-1268 (PCB-1268)

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EPA 8260C **10307003** **Volatile Organics: GC/MS (capillary column)**

Analyte Code	*Analyte*
5105	1,1,1,2-Tetrachloroethane
5160	1,1,1-Trichloroethane
5110	1,1,2,2-Tetrachloroethane
5195	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)
5165	1,1,2-Trichloroethane
4630	1,1-Dichloroethane
4640	1,1-Dichloroethylene
4670	1,1-Dichloropropene
5150	1,2,3-Trichlorobenzene
5180	1,2,3-Trichloropropane
5155	1,2,4-Trichlorobenzene
5210	1,2,4-Trimethylbenzene
4570	1,2-Dibromo-3-chloropropane (DBCP)
4585	1,2-Dibromoethane (EDB, Ethylene dibromide)
4610	1,2-Dichlorobenzene
4635	1,2-Dichloroethane (Ethylene dichloride)
4655	1,2-Dichloropropane
5215	1,3,5-Trimethylbenzene
4615	1,3-Dichlorobenzene
4660	1,3-Dichloropropane
4620	1,4-Dichlorobenzene
4665	2,2-Dichloropropane
4410	2-Butanone (Methyl ethyl ketone, MEK)
4500	2-Chloroethyl vinyl ether
4535	2-Chlorotoluene
4860	2-Hexanone
4540	4-Chlorotoluene
4910	4-Isopropyltoluene (p-Cymene)
4995	4-Methyl-2-pentanone (MIBK)
4315	Acetone
4325	Acrolein (Propenal)
4340	Acrylonitrile
4375	Benzene
4385	Bromobenzene
4390	Bromochloromethane
4395	Bromodichloromethane
4397	Bromoethane (Ethyl Bromide)
4400	Bromoform
4450	Carbon disulfide
4455	Carbon tetrachloride
4475	Chlorobenzene
4575	Chlorodibromomethane
4485	Chloroethane (Ethyl chloride)
4505	Chloroform
4645	cis-1,2-Dichloroethylene
4680	cis-1,3-Dichloropropene
4595	Dibromomethane (Methylene bromide)
4625	Dichlorodifluoromethane (Freon-12)
9375	Di-isopropylether (DIPE)
4765	Ethylbenzene
4770	Ethyl-t-butylether (ETBE) (2-Ethoxy-2-methylpropane)
4835	Hexachlorobutadiene
4870	Iodomethane (Methyl iodide)
4900	Isopropylbenzene
5240	m+p-xylene
4950	Methyl bromide (Bromomethane)
4960	Methyl chloride (Chloromethane)
5000	Methyl tert-butyl ether (MTBE)

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Analyte Code	*Analyte*
4975	Methylene chloride (Dichloromethane)
5005	Naphthalene
4435	n-Butylbenzene
5090	n-Propylbenzene
5250	o-Xylene
4440	sec-Butylbenzene
5100	Styrene
4370	T-amylmethylether (TAME)
4420	tert-Butyl alcohol
4445	tert-Butylbenzene
5115	Tetrachloroethylene (Perchloroethylene)
5140	Toluene
4700	trans-1,2-Dichloroethylene
4685	trans-1,3-Dichloropropylene
4605	trans-1,4-Dichloro-2-butene
5170	Trichloroethene (Trichloroethylene)
5175	Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)
5225	Vinyl acetate
5235	Vinyl chloride

EPA 8270D **10186002** **Semivolatile Organic compounds by GC/MS**

Analyte Code	*Analyte*
5155	1,2,4-Trichlorobenzene
4610	1,2-Dichlorobenzene
4615	1,3-Dichlorobenzene
4620	1,4-Dichlorobenzene
4735	1,4-Dioxane (1,4- Diethyleneoxide)
6380	1-Methylnaphthalene
4659	2,2'-Oxybis(1-chloropropane)
6835	2,4,5-Trichlorophenol
6840	2,4,6-Trichlorophenol
6000	2,4-Dichlorophenol
6130	2,4-Dimethylphenol
6175	2,4-Dinitrophenol
6185	2,4-Dinitrotoluene (2,4-DNT)
6190	2,6-Dinitrotoluene (2,6-DNT)
5795	2-Chloronaphthalene
5800	2-Chlorophenol
6360	2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)
6385	2-Methylnaphthalene
6400	2-Methylphenol (o-Cresol)
6460	2-Nitroaniline
6490	2-Nitrophenol
5945	3,3'-Dichlorobenzidine
6465	3-Nitroaniline
5660	4-Bromophenyl phenyl ether
5700	4-Chloro-3-methylphenol
5745	4-Chloroaniline
5825	4-Chlorophenyl phenylether
4910	4-Isopropyltoluene (p-Cymene)
6410	4-Methylphenol (p-Cresol)
6470	4-Nitroaniline
6500	4-Nitrophenol
5500	Acenaphthene
5505	Acenaphthylene
5510	Acetophenone
7005	Alachlor
6700	alpha-Terpineol
5545	Aniline
5555	Anthracene

ORELAP Fields of Accreditation

ORELAP ID: WA100006
EPA CODE: WA00037
Certificate: WA100006 - 008

Analytical Resources Inc.

4611 S. 134th Place, Suite 100
Tukwila WA 98168-3240

Issue Date: 05/12/2015 ***Expiration Date:*** 05/11/2016

As of 05/12/2015 ***this list supercedes all previous lists for this certificate number.***
Customers. Please verify the current accreditation standing with ORELAP.

Analyte Code	*Analyte*
7075	Azinphos-methyl (Guthion)
5562	Azobenzene
5595	Benzidine
5575	Benzo(a)anthracene
5580	Benzo(a)pyrene
5605	Benzo(e)pyrene
5590	Benzo(g,h,i)perylene
5600	Benzo(k)fluoranthene
5585	Benzo[b]fluoranthene
5610	Benzoic acid
5630	Benzyl alcohol
5640	Biphenyl
5760	bis(2-Chloroethoxy)methane
5765	bis(2-Chloroethyl) ether
7125	Bolstar (Sulprofos)
5670	Butyl benzyl phthalate
5671	Butyl diphenyl Phosphate
5673	Butylated Hydroxy Toluene (BHT)
5680	Carbazole
7255	Chlorfenvinphos
7300	Chlorpyrifos
5855	Chrysene
7315	Coumaphos
7330	Crotoxyphos
7385	Demeton-s
6065	Di(2-ethylhexyl) phthalate (bis(2-Ethylhexyl)phthalate, DEHP)
7410	Diazinon
5895	Dibenz(a,h) anthracene
5905	Dibenzofuran
5912	Dibutyl phenyl Phospahate
7465	Dicrotophos
6070	Diethyl phthalate
7475	Dimethoate
6135	Dimethyl phthalate
5925	Di-n-butyl phthalate
6200	Di-n-octyl phthalate
8625	Disulfoton
7550	EPN
7565	Ethion
7570	Ethoprop
7600	Fensulfothion
7605	Fenthion
6265	Fluoranthene
6270	Fluorene
6275	Hexachlorobenzene
4835	Hexachlorobutadiene
6285	Hexachlorocyclopentadiene
4840	Hexachloroethane
6315	Indeno(1,2,3-cd) pyrene
6320	Isophorone
7770	Malathion
7785	Merphos
7825	Methyl parathion (Parathion, methyl)
7850	Mevinphos
7880	Monocrotophos
7905	Naled
5005	Naphthalene
5015	Nitrobenzene
6530	n-Nitrosodimethylamine
6545	n-Nitrosodi-n-propylamine
6535	n-Nitrosodiphenylamine

Analytical Resources Inc.

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Tukwila WA 98168-3240

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Analyte Code	*Analyte*
7955	Parathion, ethyl
6605	Pentachlorophenol
6615	Phenanthrene
6625	Phenol
7985	Phorate
6665	Pyrene
5095	Pyridine
6683	Retene
8110	Ronnel
8155	Sulfotepp
8200	Tetrachlorvinphos (Stirophos, Gardona) Z-isomer
8245	Tokuthion (Prothiophos)
8262	Tributyl phosphate
8275	Trichloronate
8282	Triphenyl phosphate

EPA 8270D SIM **10242509** **Semivolatile Organic compounds by GC/MS Selective Ion Monitoring**

Analyte Code	*Analyte*
6380	1-Methylnaphthalene
6385	2-Methylnaphthalene
5500	Acenaphthene
5505	Acenaphthylene
5555	Anthracene
5575	Benzo(a)anthracene
5580	Benzo(a)pyrene
5605	Benzo(e)pyrene
5590	Benzo(g,h,i)perylene
9309	Benzo(j)fluoranthene
5600	Benzo(k)fluoranthene
5585	Benzo[b]fluoranthene
5640	Biphenyl
1201	Butyltin trichloride
5680	Carbazole
5855	Chrysene
5895	Dibenz(a,h) anthracene
5905	Dibenzofuran
5913	Dibutyltin
1202	Dibutyltin dichloride
6265	Fluoranthene
6270	Fluorene
6315	Indeno(1,2,3-cd) pyrene
1206	Monobutyltin
5005	Naphthalene
6608	Perylene
6615	Phenanthrene
6665	Pyrene
1209	Tetrabutyltin
1213	Tributyltin
1203	Tributyltin chloride

EPA 8290A **10187403** **Polychlorinated Dibenzodioxins (PCDDs) and Polychlorinated Dibenzofurans (PCDFs) by GC/HRMS**

Analyte Code	*Analyte*
9516	1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)
9519	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)
9420	1,2,3,4,6,7,8-Heptachlorodibenzofuran (1,2,3,4,6,7,8-hpcdf)
9426	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (1,2,3,4,6,7,8-hpcdd)
9423	1,2,3,4,7,8,9-Heptachlorodibenzofuran (1,2,3,4,7,8,9-hpcdf)
9471	1,2,3,4,7,8-Hexachlorodibenzofuran (1,2,3,4,7,8-Hxcdf)
9453	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (1,2,3,4,7,8-Hxcdd)

ORELAP Fields of Accreditation

ORELAP ID: WA100006
EPA CODE: WA00037
Certificate: WA100006 - 008

Analytical Resources Inc.

4611 S. 134th Place, Suite 100
Tukwila WA 98168-3240

Issue Date: 05/12/2015 ***Expiration Date:*** 05/11/2016

As of 05/12/2015 ***this list supercedes all previous lists for this certificate number.***
Customers. Please verify the current accreditation standing with ORELAP.

Analyte Code	*Analyte*
9474	1,2,3,6,7,8-Hexachlorodibenzofuran (1,2,3,6,7,8-Hxcdf)
9456	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin(1,2,3,6,7,8-Hxcdd)
9477	1,2,3,7,8,9-Hexachlorodibenzofuran (1,2,3,7,8,9-Hxcdf)
9459	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (1,2,3,7,8,9-Hxcdd)
9543	1,2,3,7,8-Pentachlorodibenzofuran (1,2,3,7,8-Pecdf)
9540	1,2,3,7,8-Pentachlorodibenzo-p-dioxin (1,2,3,7,8-Pecdd)
9480	2,3,4,6,7,8-Hexachlorodibenzofuran
9549	2,3,4,7,8-Pentachlorodibenzofuran
9618	2,3,7,8-Tetrachlorodibenzo- p-dioxin (2,3,7,8-TCDD)
9612	2,3,7,8-Tetrachlorodibenzofuran
9438	Hpcdd, total
9444	Hpcdf, total
9468	Hxcdd, total
9483	Hxcdf, total
9555	Pecdd, total
9552	Pecdf, total
9609	TCDD, total
9615	TCDF, total

EPA 9010C **10243002** **Total and Amenable Cyanide by Distillation and UV-Vis**

Analyte Code	*Analyte*
1510	Amenable cyanide
1645	Total cyanide

EPA 9013 **10193609** **Cyanide Extraction Procedure for Solids and Oils**

Analyte Code	*Analyte*
8031	Extraction/Preparation

EPA 9014 **10193803** **Titrimetric and Manual Spectrophotometric Determinative Methods for Cyanide**

Analyte Code	*Analyte*
1510	Amenable cyanide
1635	Cyanide
1645	Total cyanide

EPA 9030B **10195605** **Acid-Soluble and Acid-Insoluble sulfides: Distillation**

Analyte Code	*Analyte*
2005	Sulfide

EPA 9034 **10196006** **Titrimetric Procedure for Acid-Soluble and Acid-Insoluble Sulfides**

Analyte Code	*Analyte*
2005	Sulfide

EPA 9045D **10244607** **Soil and Waste pH**

Analyte Code	*Analyte*
1900	pH

EPA 9056A **10199607** **Determination of Inorganic Anions by Ion Chromatography**

Analyte Code	*Analyte*
1540	Bromide
1575	Chloride
1730	Fluoride
1810	Nitrate as N
1840	Nitrite as N

Analytical Resources Inc.
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Analyte Code	*Analyte*
1870	Orthophosphate as P
2000	Sulfate

EPA 9065 **10200405** **Phenolics (Spectrophotometric, Manual 4-AAP with Distillation)**

Analyte Code	*Analyte*
1905	Total phenolics

EPA 9071B **10201602** **Oil and Grease Extraction Method for sludge and sediment samples**

Analyte Code	*Analyte*
1860	Oil & Grease

EPA 9080 **10203200** **Cation-Exchange Capacity of Soils (Ammonium Acetate)**

Analyte Code	*Analyte*
1560	Cation exchange capacity

EPA 9214 **10206403** **Potentiometric Determination of Fluoride in Aqueous Samples with Ion-Selective Electrode**

Analyte Code	*Analyte*
1730	Fluoride

NWTPH-Dx **90018409** **Oregon DEQ TPH Diesel Range**

Analyte Code	*Analyte*
9369	Diesel range organics (DRO)
9488	Jet Fuel
9499	Motor Oil
2050	Total Petroleum Hydrocarbons (TPH)

NWTPH-Gx **90018603** **Oregon DEQ TPH Gasoline Range Organics by GC/FID-PID Purge & Trap**

Analyte Code	*Analyte*
9408	Gasoline range organics (GRO)

NWTPH-HCID **90013200** **Oregon DEQ Total Petroleum Hydrocarbon ID**

Analyte Code	*Analyte*
2050	Total Petroleum Hydrocarbons (TPH)

PLUMB 1981 **60006259** **Extraction/Preparation**

Analyte Code	*Analyte*
6118	Distribution of particle sizes
8031	Extraction/Preparation

Puget Sound Estuary Program (PSEP): Conventional Sediment Variables **60006408** **PSEP: Organotins, TOC, and Sulfide**

Analyte Code	*Analyte*
1201	Butyltin trichloride
5913	Dibutyltin
1202	Dibutyltin dichloride
1206	Monobutyltin
2005	Sulfide
1209	Tetrabutyltin
2040	Total organic carbon
1213	Tributyltin
1203	Tributyltin chloride

ORELAP Fields of Accreditation

ORELAP ID: WA100006
EPA CODE: WA00037
Certificate: WA100006 - 008

Analytical Resources Inc.

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SM 2540 G-1997 **20005269** **Total, Fixed, and Volatile Solids in Solid and Semisolid Samples**

Analyte Code	*Analyte*
1725	Total, fixed, and volatile residue

SM 2580 B 20th ED **20054051** **Oxidation-Reduction Potential Measurement in Clean Water**

Analyte Code	*Analyte*
1871	O-R Potential

SM 3500-Cr B-2009 online **20066255** **Chromium by Colorimetric Method**

Analyte Code	*Analyte*
1045	Chromium VI

SM 4110 B-2000 **20076908** **Anions by Ion Chromatography**

Analyte Code	*Analyte*
1540	Bromide
1575	Chloride
1730	Fluoride
1810	Nitrate as N
1840	Nitrite as N
1870	Orthophosphate as P
2000	Sulfate

SM 4500-CN^- C-97 online **20095607** **Cyanide by Total Cyanide after Distillation**

Analyte Code	*Analyte*
1635	Cyanide
1645	Total cyanide

SM 4500-CN^- E-97 online **20096406** **Cyanide by Colorimetric Method**

Analyte Code	*Analyte*
1635	Cyanide

SM 4500-CN^- I-97 online **20098004** **Cyanide by Weak Acid Dissociable Cyanide**

Analyte Code	*Analyte*
2074	Weak Acid Dissociable Cyanide

SM 4500-F^- C-97 online **20102403** **Fluoride by Ion-Selective Electrode Method**

Analyte Code	*Analyte*
1730	Fluoride

SM 4500-NH3 D-97 online **20109404** **Ammonia by Ammonia-Selective Electrode Method .**

Analyte Code	*Analyte*
1515	Ammonia as N

SM 4500-NH3 H-97 online **20112203** **Ammonia by Flow Injection Analysis**

Analyte Code	*Analyte*
1515	Ammonia as N

SM 4500-$NO3^-$ I-00 online **20116501** **Nitrate Nitrite (as N) flow injection Cadmium Reduction**

Analyte Code	*Analyte*

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Analyte Code	*Analyte*
1805	Nitrate
1820	Nitrate-nitrite
1835	Nitrite

SM 4500-Norg D 21st ED **20120267** **Nitrogen (Organic) by Block Digestion and Flow Injection Analysis**

Analyte Code	*Analyte*
1790	Kjeldahl nitrogen
1795	Kjeldahl nitrogen - total

SM 4500-P B 21st ED **20122809** **Phosphorus by Sample Preparation**

Analyte Code	*Analyte*
1910	Phosphorus, total

SM 4500-P E-1999 **20124214** **Phosphorous by Ascorbic Acid Method**

Analyte Code	*Analyte*
1870	Orthophosphate as P
1910	Phosphorus, total
1908	Total Phosphate

SM 4500-S2 D-2000 **20125853** **Sulfide by Methylene Blue Method**

Analyte Code	*Analyte*
2005	Sulfide

SM 5520 E-05 online **20142807** **Oil and Grease by Extraction Method for Sludge Samples**

Analyte Code	*Analyte*
1860	Oil & Grease

SM 5520 F-05 online **20143208** **Oil and Grease by Hydrocarbons**

Analyte Code	*Analyte*
1803	n-Hexane Extractable Material (O&G)
1860	Oil & Grease

SM 5530 D-2005 **20143764** **Phenols by Direct Photometric Method**

Analyte Code	*Analyte*
1905	Total phenolics

WA EPH **60015001** **Extractable Petroleum Hydrocarbons**

Analyte Code	*Analyte*
6211	EPH Aliphatic >C10-C12
6212	EPH Aliphatic >C12-C16
6214	EPH Aliphatic >C16-C21
6216	EPH Aliphatic >C21-C34
6220	EPH Aliphatic C8-C10
6222	EPH Aliphatic C9-C18
6224	EPH Aromatic >C10-C12
6226	EPH Aromatic >C12-C16
6228	EPH Aromatic >C16-C21
6236	EPH Aromatic C8-C10

WA VPH **60015056** **Volatile Petroleum Hydrocarbons (VPH) by GC/PID Purge & Trap**

Analyte Code	*Analyte*

ORELAP Fields of Accreditation

ORELAP ID: WA100006
EPA CODE: WA00037
Certificate: WA100006 - 008

Analytical Resources Inc.

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Analyte Code	*Analyte*
5300	VPH Aliphatic >C10-C12
5301	VPH Aliphatic >C6-C8
5302	VPH Aliphatic >C8-C10
5303	VPH Aliphatic C5-C6
5308	VPH Aromatic >C10-C12
5309	VPH Aromatic >C12-C13
5310	VPH Aromatic >C8-C10

APPENDIX F

SAMPLING 2-66 SHEET PILE BACKFILL ANALYTICAL RESULTS

Table 5: ANALYTICAL REPORT
CADMAN IMPORT BACKFILL

Am Test Inc.
13600 NE 126TH PL
Suite C
Kirkland, WA 98034
(425) 885-1664
www.amtestlab.com

AMTEST LABORATORIES

Professional Analytical Services

ANALYSIS REPORT

Cadman
7554 185th Ave NE
Redmond, WA 98052
Attention: Mitch San Sebastian
All results reported on a dry weight basis.

Date Received: 07/07/11
Date Reported: 7/12/11

AMTEST Identification Number 11-A009388
Client Identification Gravel Barrow - Black Diamond
Sampling Date 07/06/11

Conventionals dry weight

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Hexavalent Chromium	< 0.16	ug/g		0.16	SM 3500-Cr D	NLN	07/11/11

Conventionals

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Total Solids	94.7	%		0.1	SM 2540G	NLN	07/11/11

Minerals

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Calcium	3900	ug/g		1.35	SW-846 6010B	HL	07/12/11
Potassium	380	ug/g		2.70	SW-846 6010B	HL	07/12/11
Magnesium	7200	ug/g		1.35	SW-846 6010B	HL	07/12/11
Sodium	215.4	ug/g		1.35	SW-846 6010B	HL	07/12/11

Total Metals

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Acid Digestion	Y				SW-846 3050B	HL	07/08/11
Silver	< 1.4	ug/g		0.270	SW-846 6010B	HL	07/12/11
Aluminum	15900	ug/g		0.270	SW-846 6010B	HL	07/12/11
Arsenic	2.27	ug/g		0.270	SW-846 6010B	HL	07/12/11
Boron	< 1.35	ug/g		1.35	SW-846 6010B	HL	07/12/11
Barium	32.0	ug/g		0.013	SW-846 6010B	HL	07/12/11
Beryllium	0.243	ug/g		0.013	SW-846 6010B	HL	07/12/11
Cadmium	0.6441	ug/g		0.013	SW-846 6010B	HL	07/12/11
Cobalt	8.26	ug/g		0.027	SW-846 6010B	HL	07/12/11
Chromium	31.9	ug/g		0.027	SW-846 6010B	HL	07/12/11
Copper	23.7	ug/g		0.027	SW-846 6010B	HL	07/12/11
Iron	20700	ug/g		0.135	SW-846 6010B	HL	07/12/11
Mercury	< 1.35	ug/g		0.270	SW-846 6010B	HL	07/12/11
Lithium	15.1	ug/g		0.135	SW-846 6010B	HL	07/12/11
Manganese	488.	ug/g		0.013	SW-846 6010B	HL	07/12/11
Molybdenum	3.97	ug/g		0.135	SW-846 6010B	HL	07/12/11
Nickel	24.1	ug/g		0.135	SW-846 6010B	HL	07/12/11
Phosphorus	324.	ug/g		0.270	SW-846 6010B	HL	07/12/11
Lead	< 1.35	ug/g		0.270	SW-846 6010B	HL	07/12/11
Sulfur	111.	ug/g		1.35	SW-846 6010B	HL	07/12/11
Antimony	4.49	ug/g		0.270	SW-846 6010B	HL	07/12/11
Selenium	< 1.35	ug/g		0.270	SW-846 6010B	HL	07/12/11
Silicon	359.	ug/g		1.35	SW-846 6010B	HL	07/12/11
Tin	< 0.676	ug/g		0.135	SW-846 6010B	HL	07/12/11
Strontium	16.7	ug/g		0.013	SW-846 6010B	HL	07/12/11
Titanium	339.	ug/g		0.027	SW-846 6010B	HL	07/12/11
Thallium	< 1.35	ug/g		0.270	SW-846 6010B	HL	07/12/11
Vanadium	31.4	ug/g		0.135	SW-846 6010B	HL	07/12/11
Yttrium	< 0.0634	ug/g		0.013	SW-846 6010B	HL	07/12/11
Zinc	39.3	ug/g		0.027	SW-846 6010B	HL	07/12/11

NWTPH-Dx (Soil)

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Diesel	< 25	mg/kg		25.	WDOE NWTPH-Dx	MO	07/11/11
Heavy Oil	< 50	mg/kg		50.	WDOE NWTPH-Dx	MO	07/11/11

Cadman
Project Name:
AmTest ID: 11-A009388

Surrogates

ANALYTE	% RECOVERY	LIMITS
Bromofluorobenzene	56.2 %	50.0 - 150.
2-Fluorobiphenyl	70.8 %	50.0 - 150.

Aaron W. Young
Laboratory Manager

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Table 6: ANALYTICAL REPORT
CITY TRANSFER IMPORT BACKFILL

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS
Page 1 of 1

Sample ID: SP-1
SAMPLE

Lab Sample ID: TN93A
LIMS ID: 11-21000
Matrix: Soil
Data Release Authorized:
Reported: 09/27/11

QC Report No: TN93-Gary Merlino Construction Co Inc
Project: CTI Sumner

Date Sampled: 09/23/11
Date Received: 09/23/11

Percent Total Solids: 96.3%

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/kg-dry	Q
3050B	09/26/11	6010B	09/26/11	7440-36-0	Antimony	5	5	U
3050B	09/26/11	6010B	09/26/11	7440-38-2	Arsenic	5	8	
3050B	09/26/11	6010B	09/26/11	7440-39-3	Barium	0.3	61.9	
3050B	09/26/11	6010B	09/26/11	7440-41-7	Beryllium	0.1	0.2	
3050B	09/26/11	6010B	09/26/11	7440-43-9	Cadmium	0.2	0.2	U
3050B	09/26/11	6010B	09/26/11	7440-47-3	Chromium	0.5	19.2	
3050B	09/26/11	6010B	09/26/11	7440-50-8	Copper	0.2	28.9	
CLP	09/26/11	7471A	09/26/11	7439-92-1	Lead	2	3	
3050B	09/26/11	6010B	09/26/11	7439-97-6	Mercury	0.02	0.02	U
3050B	09/26/11	6010B	09/26/11	7440-02-0	Nickel	1	16	
3050B	09/26/11	6010B	09/26/11	7782-49-2	Selenium	5	5	U
3050B	09/26/11	6010B	09/26/11	7440-22-4	Silver	0.3	0.3	U
3050B	09/26/11	6010B	09/26/11	7440-28-0	Thallium	5	5	U
3050B	09/26/11	6010B	09/26/11	7440-66-6	Zinc	1	38	

U-Analyte undetected at given RL
RL-Reporting Limit.

FORM-I

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS
Page 1 of 1

ANALYTICAL RESOURCES INCORPORATED

Sample ID: LAB CONTROL

Lab Sample ID: TN93LCS
LIMS ID: 11-21000
Matrix: Soil
Data Release Authorized:
Reported: 09/27/11

QC Report No: TN93-Gary Merlino Construction Co Inc
Project: CTI Summer

Date Sampled: NA
Date Received: NA

BLANK SPIKE QUALITY CONTROL REPORT

Analyte	Analysis Method	Spike Found	Spike Added	% Recovery	Q
Antimony	6010B	198	200	99.0%	
Arsenic	6010B	196	200	98.0%	
Barium	6010B	192	200	96.0%	
Beryllium	6010B	47.4	50.0	94.8%	
Cadmium	6010B	49.8	50.0	99.6%	
Chromium	6010B	49.1	50.0	98.2%	
Copper	6010B	49.9	50.0	99.8%	
Lead	6010B	194	200	97.0%	
Mercury	7471A	0.26	0.25	104%	
Nickel	6010B	48	50	96.0%	
Selenium	6010B	192	200	96.0%	
Silver	6010B	50.7	50.0	101%	
Thallium	6010B	192	200	96.0%	
Zinc	6010B	48	50	96.0%	

Reported in mg/kg-dry

N-Control limit not met
NA-Not Applicable, Analyte Not Spiked
Control Limits: 80-120%

FORM-VII

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS
Page 1 of 1

Sample ID: METHOD BLANK

Lab Sample ID: TN93MB
LIMS ID: 11-21000
Matrix: Soil
Data Release Authorized:
Reported: 09/27/11

QC Report No: TN93-Gary Merlino Construction Co Inc
Project: CTI Sumner

Date Sampled: NA
Date Received: NA

Percent Total Solids: NA

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/kg-dry	Q
3050B	09/26/11	6010B	09/26/11	7440-36-0	Antimony	5	5	U
3050B	09/26/11	6010B	09/26/11	7440-38-2	Arsenic	5	5	U
3050B	09/26/11	6010B	09/26/11	7440-39-3	Barium	0.3	0.3	U
3050B	09/26/11	6010B	09/26/11	7440-41-7	Beryllium	0.1	0.1	U
3050B	09/26/11	6010B	09/26/11	7440-43-9	Cadmium	0.2	0.2	U
3050B	09/26/11	6010B	09/26/11	7440-47-3	Chromium	0.5	0.5	U
3050B	09/26/11	6010B	09/26/11	7440-50-8	Copper	0.2	0.2	U
CLP	09/26/11	7471A	09/26/11	7439-92-1	Lead	2	2	U
3050B	09/26/11	6010B	09/26/11	7439-97-6	Mercury	0.02	0.02	U
3050B	09/26/11	6010B	09/26/11	7440-02-0	Nickel	1	1	U
3050B	09/26/11	6010B	09/26/11	7782-49-2	Selenium	5	5	U
3050B	09/26/11	6010B	09/26/11	7440-22-4	Silver	0.3	0.3	U
3050B	09/26/11	6010B	09/26/11	7440-28-0	Thallium	5	5	U
3050B	09/26/11	6010B	09/26/11	7440-66-6	Zinc	1	1	U

U-Analyte undetected at given RL
RL-Reporting Limit

FORM-I

September 22, 2011

Gary Merlino Construction
Attn: Brian Gabelien
9125 10th Avenue S
Seattle, WA 98108

PROJECT: Plant 2 South Shoreline Stormwater

RE: Clean Resource Verification
State Pit I.D. # B-231

Dear Mr. Gabelien,

City Transfer, Inc. has operated the Sumner gravel pit # B-231 since first permitted in 1978. This resource is permitted for crushing and washing production of WSDOT certified materials. The resource is not permitted for asphalt production or recycling.

Phase 1 environmental study was performed in conjunction with source approval for the Port of Seattle Third Runway project.

To the best of my knowledge, pit operations have not incurred any environmental accidents, spills, or waste. The resource does not receive any environmentally sensitive materials such as asphalt, concrete, or unsuitables.

Should you have any questions or require additional information, please let me know.

Best Regards,

Keith R. Benson
President

P.O. Box 1650 * Sumner, WA 98390-0400
2720 E. Valley Hwy. East * Sumner, WA 98390 * Seattle (253) 850-1776 * Tacoma (253) 863-4566 * Fax (253) 850-1797